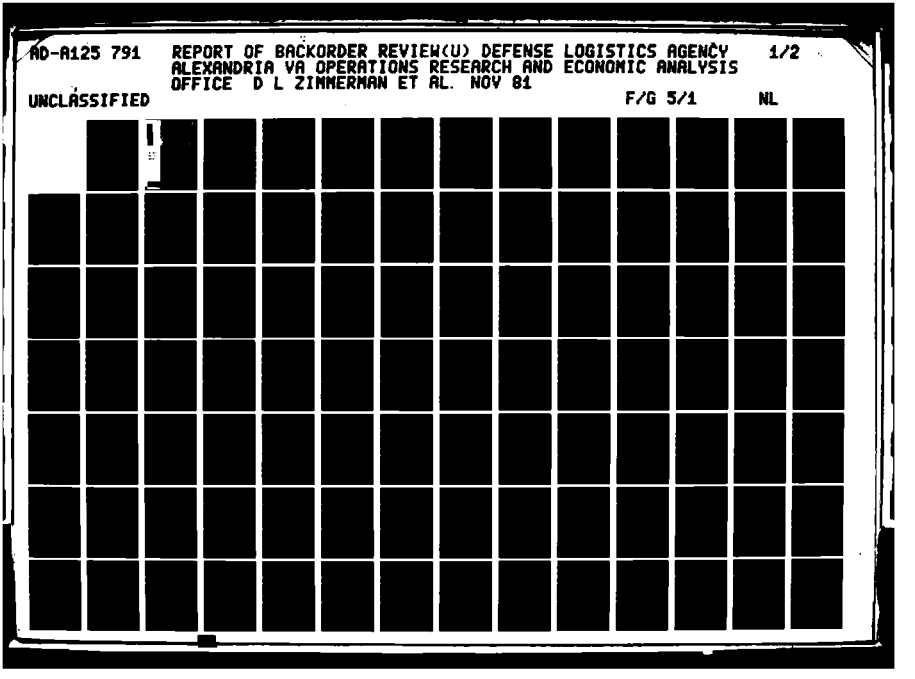
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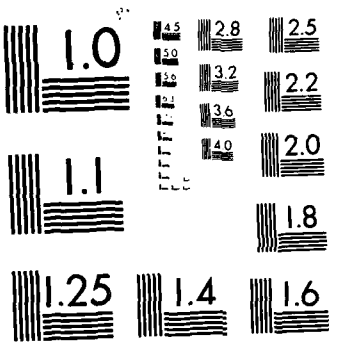

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DEPARTMENT OF DEFENSE

DEFENSE LOGISTICS AGENCY

Cameron Station,
Alexandria, Virginia 22314

REPORT OF BACKORDER REVIEW

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This report documents a backorder review conducted by the Operations Research and Economic Analysis Office of the Defense Logistics Agency from August to October 1981. The review was aimed at identifying the causes of backorders and possible approaches to reducing their number. Information and data contained in this report are based on input available at the time of the review. Because the findings and conclusions are subject to change, this report should not be construed to represent the official position of the Defense Logistics Agency.

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DEFENSE LOGISTICS AGENCY
HEADQUARTERS
CAMERON STATION
ALEXANDRIA, VIRGINIA 22314

DLA-LO

FOREWORD

This report documents a backorder review conducted by the Operations Research and Economic Analysis Office of the Defense Logistics Agency from August 1981 to October 1981. The review was aimed at identifying the causes of backorders and possible approaches to reducing their number. Information and data contained in this report are based on input available at the time of the review. Because the findings and conclusions are subject to change, this report should not be construed to represent the official position of the Defense Logistics Agency.

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Executive Summary

INTRODUCTION. In response to the Director's question concerning the need for a backorder review, the Office of the Assistant Director for Plans, Policies and Programs (DLA-L) proposed in a memorandum to the Director that a backorder review be initiated to improve the Agency's backorder position. The Director agreed and the Operations Research and Economic Analysis Office (DLA-LO) was tasked to perform the review. A review team was formed and conducted the review using a three-prong approach of a literature search, interviews, and data analysis.

BACKORDERS AS A MEASURE OF PERFORMANCE. A backorder is any customer demand which cannot be immediately satisfied from on-hand stock. Traditionally, backorders have been a primary measure of performance of supply organizations. However, as DLA's primary measure of performance, backorders have a number of shortcomings and the chief one being that it does not directly link wholesale supply performance to military readiness. This shortcoming could be diminished if DLA replaced its single backorder goal with a series of backorder goals based on weapons systems support.

CAUSES OF BACKORDERS. The leading causes of backorders are unforecasted demand, delinquent deliveries, extended leadtimes, contracting difficulties, inventory loss, and logistics transfer. Based on the data source, these causes accounted for 85 to 100 percent of the backorders. Although the causes for backorders rank differently among DLA's inventory control points (ICPs), the number one cause appears to be unforecasted demands. (See Table 1, page 4)

STATISTICS. Overall statistics indicate that an ICP's percent of the total DLA backorders corresponds to its percent of the total demand frequency. Accordingly, the Defense Industrial Supply Center (DISC) has the largest number of backorders while the Medical commodity at the Defense Personnel Support Center (DPSC) has the smallest. Within an ICP, items with the highest demand frequency or dollar value of annual demand have the highest number of backorders. This could be attributed to unforecasted demand or late receipt of materiel; the former where an unexpected surge in demand causes a low demand item to become a high demand item with a large number of backorders and the latter where a delinquent delivery or extended leadtime results in a greater number of backorders in the case of a high demand item than a low demand item.

WAYS TO REDUCE BACKORDERS. In seeking ways to reduce backorders, the review team examined demand forecasting, late receipt of materiel, investment, stockage policy rules, depot operations, contract administration, backorder management, and item management. Under demand forecasting, the team looked at improving DLA's forecasting technique, use of program data, demand variance, item grouping, controls on adjusting forecasts, communication with prime customers, and customer research. Under late receipt of materiel, the team investigated trends in administrative leadtimes (ALTs) and production leadtimes (PLTs), how leadtimes are computed, and reducing delinquent deliveries. Under the other topics, the team considered procurement cycles, safety levels, provisioning/new item procedures, budget restrictions, market research, automated materiel management, and a number of other subjects.

In each of the subjects, the review team examined current procedures and ways to improve those procedures. To accomplish this, the team relied on information collected in its interviews and literature search as well as its own knowledge of the subjects.

RECOMMENDATIONS. The review team compiled the following list of recommendations for reducing backorders:

1. DLA should improve its demand forecasting by expanding its current forecasting study and by developing a customer research capability.

2. DLA should initiate action to stop or reverse the upward trend in ALT.

3. DLA should develop more accurate estimates of PLTs through market research.

4. DLA should continue to find ways to reduce delinquent deliveries and consider how delinquencies can be included in the computation of requirements levels.

5. DLA should improve its stockage policy rules by developing different sets of rules for different categories of items and by considering the dynamic nature of items in all of its rules.

6. DLA ICPs should develop budget execution plans, supported by analytical models, which measure performance impacts of alternative budget execution schemes.

7. DLA should continue to develop depot procedures for releasing backorders faster and should consider expanding the procedures to include potential backorder items.

8. DLA should use contract administrators to identify potential tardy contractors and to emphasize to contractors the need for prompt or accelerated delivery of materiel for items on backorder.

9. DLA should expand its current management information systems for backorders to include information on causes of backorders in order to highlight problem areas.

10. DLA should set different backorder goals for different categories of items in order to increase its weapons systems support and should set goals above funded limits only when there is a reasonable expectation of improvement.

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Report on Backorder Review

I. INTRODUCTION

A. Objective. To review causes for backorders in order to recommend ways that DLA can improve its backorder position.

B. Background. On 9 July 1981, the Director, DLA, asked DLA-L if it would be productive to have the Headquarters' operations research staff review the causes of backorders. DLA-L felt that a backorder review would be productive and proposed to the Director, that a backorder review be initiated to improve the Agency's backorder position. The Director agreed and tasked the Supply Operations Directorate (DLA-O) and DLA-L with conducting the review. DLA-L tasked DLA-LO to perform DLA-L's part of the review. At subsequent meetings between DLA-O and DLA-LO personnel, DLA-O proposed to update a 1980 backorder analysis it conducted and present it to the Director and also agreed to an independent DLA-LO review which would address short and long term aspects of DLA's backorder problem. This report documents the findings of the DLA-LO review.

C. Scope. The scope of the review was broad. It considered topics covering several functional areas (e.g., contracting, supply operations, technical operations, Automated Data Processing (ADP) systems). Information collected for the review came from Headquarters and ICP levels and was extracted from existing or new reports. Subsistence and fuels were not a part of this review.

D. Approach.

1. Review Team. The general approach was first to identify the causes of backorders and then to identify ways to reduce their impacts. To accomplish this, DLA-LO formed a review team. That team relied on a three-prong approach to conduct its review; namely, a literature search, interviews, and data analysis. In what follows, each of these prongs is described in greater detail. The thrust of the approach was to take the greatest advantage of past and present backorder analyses to produce a list of recommendations for reducing backorders. The review team had hoped to put a price tag on each of its recommendations but the two-month time frame for the review was inadequate to develop cost information.

2. Literature Search. The literature search was aimed at compiling a compendium of backorder studies and a summary of their findings. The compendium includes past and present DLA backorder analyses plus backorder analyses conducted by other DoD Components and by other organizations managing large inventories. The Defense Technical Information Center (DTIC), the Defense Logistics Studies Information Exchange (DLSIE), General Accounting Office (GAO), and the Department of the Interior (DoI) were sources of bibliographies on backorder analyses/studies in addition to DLA and DoD study organizations. Appendix C is the results of the team's literature search. That appendix could serve as a source of information for future work in the area of backorders.

3. Interviews. Interviews with Principal Staff Elements (PSEs) and ICPs were aimed at compiling lists of: (a) causes of backorders; (b) data

sources on backorders; (c) ideas for improving DLA's backorder position; and (d) alternatives for managing backorders. These interviews were structured; i.e., they were directed at obtaining answers to specific questions. Appendices A through F document the interviews.

4. Data Analysis. Data analysis focused on developing a profile of items with backorders and at quantifying relationships between causal variables and backorders. Information sources included existing reports or new reports compiled from DLA data files.

II. CAUSES OF BACKORDERS

A. Definition of a Backorder. A backorder is any customer demand which cannot be immediately satisfied from on-hand stock. It is also referred to as a materiel obligation or a due-out or delayed issue. In DLA, two types of backorders exist and are termed BB and BV after their associated status codes. BB backorders are backorders which are placed in a hold status awaiting receipt of materiel on order. BV backorders are backorders which are forwarded to the Contracting directorate where direct vendor deliveries (DVDs) are awarded to satisfy them. (The BV backorders can be on stocked and nonstocked items. The BB backorders are normally on stocked items but can occur on nonstocked items if due-ins exist.) For the most part, the information which the review team obtained was on BB backorders.

1. Definitional Problems. In defining a backorder, the following issues arose:

a. Should item stockage classification determine what is or what is not a backorder? A backorder against an item classified nonstocked is treated as a BV backorder and is not counted as a backorder for purposes of computing ICP supply availability. If the same item was classified stocked, the backorder would be counted.

b. Should the customer's identity determine if an unsatisfied demand is or is not a backorder? For example, a foreign military sale (FMS) which is backordered is not counted until 330 days have elapsed. (An FMS backorder is counted before 330 days under the statistic "NSNs with Backorders.")

2. Backorders as a Measure of Performance. The purpose of inventory is to satisfy customer demand. Consequently, in inventory control theory, unsatisfied demand or backorders are negative indicators of performance. Supply availability is defined as the number of unsatisfied demands/backorders against the net stocked requisitions received during a specified time period. Throughout the history of DLA and other DoD supply organizations, supply availability has been the primary measure of ICP performance. Sometimes it is referred to as stock availability or supply materiel availability; but it has always been the measure of the number of backorders against the total number of customer demands. However, as the primary measure of ICP performance, the number of backorders has these shortcomings:

a. It does not directly link wholesale supply performance to military readiness. An overall availability of 90 percent is only a general feel for an ICP's ability to respond to customer demand. It does not reflect

any relationships which customer demands may have on military readiness. Specifically, a backorder on a weapons systems item is counted the same as a backorder on a nonweapons systems item; emergency demands count the same as routine demands. This shortcoming could be diminished if DLA replaced its single backorder goal for all items with a series of backorder goals based on weapons systems support.

b. It does not span all aspects of supply performance. The number of backorders established is different from the number of backorders outstanding (on hand) which in turn is different from the average time to fill a backorder. All of these are important measures of backorder and supply performance. A customer whose demand is backordered is not interested i other customers' demands which are satisfied but is interested in when hi demand will be satisfied. This is particularly true if the demand is for repair part needed to resolve a not mission capable supply (NMCS) situation The DoD Stockage Policy Analysis Report of August 1980 considered response tim or average time to fill a requisition as "the most appropriate measure o supply performance relative to inventory investment." That measure is a weighted average of the ICP time to satisfy immediately filled requisitions and the ICP time to satisfy backordered requisitions.

c. It may overstate supply performance since it gives no indication of the quality of the items which are issued. Filling a demand with the wrong item or with defective or damaged stock may avoid a backorder but it does not satisfy the customer's demand.

d. It may understate supply performance since it considers partial issues as backorders. A partial issue may satisfy a customer's immediate need until the backordered portion is delivered.

e. It may overstate supply performance as it does not account for fill-or-kill requisitions.

f. It does not reflect aspects of ICP performance which are not supply related. For example, in seeking to award a contract to small business, the buyer may extend ALT which in turn causes backorders. In this case, contracting's measure of small business participation is positively increased while the backorder measure is negatively increased. Of course, backorders do not always increase with small business awards or with any other actions where nonsupply measures are being improved. The point is, that it can happen if each directorate pursues its goals with no way of assessing how its actions impact on backorders.

3. List of Causes. Upon initiating the search for information on causes of backorders in DLA, the review team found that, although management information systems exist in DLA which count and track backorders, none of these information systems break out the data by specific causes. However, since backorders are a primary measure of ICP performance, DLA-O and the ICPs have conducted numerous backorder studies. The review team was able to extract the required information from these studies.

a. Table of Causes of Backorders. The following table lists causes of backorders extracted from various DLA backorder studies.

Table 1. Causes of Backorders

Cause	Percent of Backorders						
	DLA-O (lines)	DGSC (NSNs)	DPSC-T (lines)	DPSC-A (lines)	DISC (lines)	DESC (NSNs)	DCSC (lines)
Unforecasted Demand	26	17.0	75.4	29.7	40	66.1	15.7
Delinquent Deliveries	17	34.5	13.1	52.2	22	9.3	13.7
Extended Leadtimes	17	24.5			12	6.2	9.3
Contracting Difficulties	13	5.5		18.1	5	2.4	15.8
Inventory Loss	12	6.0			2	5.1	6.3
Formerly Managed Nonstock	7	5.0					5.2
Logistics Transfer		2.5			1	10.1	
Other	8	5.0	11.5		18	.8	
No Cause Provided							34.0

2. Sources for Table Information. In reviewing the causes of the backorders, the source of data is important. Causes may be different depending on if the source focuses on reasons backorders are established or on reasons backorders remain on file. The above data was collected from the following sources:

DLA-O: "Backorders: Trends and Current Status," was a handout which was presented to the Director on 2 September 1981. The percentages reflect a collation of data from a sample from each hardware Center. They relate to the number of backorder lines outstanding.

DGSC: "Top 200 B/O Reason Survey (July 1981)," produced by the Supply Operations personnel, covers only the top 200 backordered items with the most backorder lines.

DPSC-T: "Special Review of Materiel Obligations (March 1981)," covers the reasons for the lines on backorder through the end of February 1981.

DPSC-A: "Monthly Analysis of the Causes of Materiel Obligations (1 August 1981)," covers the reasons for the lines on backorder through the end of July 1981.

DISC: Quarterly backorder studies take the latest month values on backorder lines established and determines why those backorders were established. The chart reflects an average from the five latest studies.

DESC: The response to a DLA-OSM message, 12 December 1980, used figures concerning the number of NSNs on backorder as of 30 November 1980. Two prior studies provided the foundation for that response: "The Report of the Backorder Study Group" and "The Study on NSNs in the Top 100 Backorder Positions."

DCSC: "Backorder Analysis (March 1981)," was performed by a Supply Operations study group. A sample of 800 NSNs was used to determine the causes of backorders.

C. Explanation of Causes.

1. Unforecasted Demand. Many backorders are caused because DLA's forecasting technique is not able to keep up with unexpected surges in demand for an item. Consequently, if there is not sufficient stock on hand to cover the surge or if stock on hand is deleted to a point below which it can meet expected demand, backorders will occur.

2. Delinquent Deliveries. Delinquent deliveries occur when items have not been shipped by the contract delivery date (CDD) and when there exists no official modification to the CDD extending such delivery date. They may be caused by the contractor and/or the Government. (See list of causes in Subparagraph IIIC3.) Backorders occur when the stock on hand is exhausted as the delinquent delivery is not received.

3. Extended Leadtimes. Backorders may be caused if either the ALT, the PLT, or both (total leadtime) have been underestimated. (See list of causes in Subparagraph IIIC1 and 2.)

4. Contracting Difficulties. These include pre-award problems, noncontractable items, cancelled contracts, and specification problems.

5. Inventory Loss. Inventory loss is primarily due to improper recordkeeping by the ICPs, stock damaged by the depots, and the limited shelf life of certain stocked items.

6. Formerly Managed Nonstock. Backorders are created when items are transferred from nonstocked to stocked status.

7. Logistics Transfer. A dry or inadequate pipeline during a logistics transfer is another cause for backorders. This situation occurs after DLA has assumed management of items from other Services and when those items have insufficient assets, no outstanding procurement, and/or the sources of manufacturer are unknown.

8. Other. There exist many other causes of backorders. Most of these causes are common to all ICPs; a few are unique to one or two ICPs. Some general causes are: new NSNs; management policies, such as setting the control [illegible] at a certain level below which only high priority issues can be made; [illegible] and substitutability problems; cataloging problems; turbulence in [illegible] sizes; reinstated NSNs; and policy backorders for FMS and prepositioned war reserves.

9. Backorder Profiles. In preparing statistics on backorders, the team recognized the fact that their numbers were as of a certain date. This is an important consideration since DLA has a dynamic inventory. An analysis performed by DESC shows a very dynamic inventory in which items regularly [illegible] from one demand category to another. Surges in demand can cause an item with low annual demand at one point in time to become an item with a high annual demand and a large number of backorders at another point in time. Likewise, drops in demand can cause an item with a high annual demand to become an item with low annual demand, excess stocks, and little probability of backorder. [illegible] types of item migration are not reflected in backorder statistics. The team did not base any of its conclusions on the statistics alone.

1. ICP Statistics. The review team recorded the following ICP backorder statistics from DLA's RCS-96 Report and Selected Management Data Report (SMDR) as of July-August 1981. According to these statistics, DISC has the largest number of demands for stocked items (5,117,000); the largest number of backorders established (536,000); the largest number of backorders outstanding (154,000); and the largest average time on backorder (81.1 days). DISC documented its backorder problem in a letter to DLA-D, dated 20 August 1981. DPSC-T attributed, at least in part, their low backorder level to the Directorate of Manufacturing. Overall, the statistics indicate that an ICP's percent of backorders corresponds to its percent of demand frequency.

Table 2. ICP Backorder Statistics

ICP	Number of Demands (Stocked) Lines (000)	%	Number of Backorders Established Lines (000)	%	Backorders Outstanding Lines (000)	%	Average Time on Backorder Days
DGSC	2,133	12.5	274	16.5	59.6	15.5	68.9
DISC	5,117	29.9	536	32.2	154.0	40.0	81.1
DPSC	1,315	7.7	61	3.7	7.8	2.0	49.1
Medical							
DPSC	2,081	12.2	190	11.4	17.4	4.5	28.0
C&T							
DESC	3,875	22.7	382	22.9	90.7	23.6	75.3
DCSC	2,575	15.0	221	13.3	55.6	14.4	71.2
TOTAL	17,096	100.0	1,664	100.0	385.1	100.0	

2. Relationship between Demand Frequency and Backorders. The data from the ICPs indicated that items with the highest demand frequency have the highest number of lines on backorder. This correlation was not unexpected in view of item migration and the fact that late receipt of materiel from contractors would have a greater impact on high demand items than low demand items. This is compounded by the fact that demand frequency statistics cover a period of time while statistics on backorders outstanding are as of a point in time.

a. DGSC. The statistics from DGSC, which came from its "Selective Management Category Code (SMCC) Report," highlight that only two percent of the items account for 41 percent of the lines on backorder. These items have 300 or more demands (requisitions) against them during a year. At the other end of the demand spectrum, 70 percent of the items account for only 14 percent of the backorders.

Table 3. DGSC Demand Frequency and Backorders
(31 August 1981)

Demand Frequency	% of Items	Backorders Outstanding BB Lines	BV Lines	Total Backorder Lines	%
300+	2.38	21,276	200	21,476	40.7
100-299	5.09	10,005	346	10,351	19.6
51-99	6.36	6,104	205	6,309	12.0
20-50	16.27	7,109	283	7,392	14.0
1-19	69.91	6,639	561	7,200	13.7
TOTAL	100.00	51,133	1,595	52,728	100.0

b. DISC. DISC wrote a special computer program to obtain the demand frequency and backorder statistics. Their program showed that two percent of the items account for 17 percent of the backorders. These items have 300 or more demands against them during a year. Items having only 1 to 49 demands against them during a year account for 85 percent of the items but only 46 percent of the backorders.

Table 4. DISC Demand Frequency and Backorders
(31 August 1981)

Demand Frequency	% of Items	Backorders Outstanding BB Lines	BV Lines	Total Backorder Lines	%
300+	1.5	23,849	233	24,082	17.3
100-299	5.5	28,156	647	28,803	20.7
50-99	7.7	22,218	588	22,806	16.4
1-49	85.3	59,101	4,471	63,572	45.6
TOTAL	100.0	133,324	5,939	139,263	100.0

c. DESC. DESC, using its "SMCC Report," obtained demand frequency and backorder statistics that indicated that items with 200 or more demands against them during a year are only one percent of the items, but they generate 37 percent of the backorders. Items with 0 to 19 demands against them during a year are 92 percent of the items but they generate 44 percent of the backorders.

Table 5. DESC Demand Frequency and Backorders
(31 July 1981)

Demand Frequency	% of Items	Total Backorder Lines (BB & BV)	%
200+	.6	16,700	18.4
20-199	7.8	34,400	37.8
0-19	91.6	39,800	43.8
TOTAL	100.0	90,900	100.0

d. DPSC - Clothing and Textiles (DPSC-T). DPSC-T used a special computer program to develop Clothing and Textiles demand frequency and backorder statistics. One percent of the items experience 38 percent of the materiel obligations. These items generate 32 percent of the net demand lines. Twenty percent of the items incur 95 percent of the materiel obligations. This percentage of items generates 95 percent of the net demand lines. Clothing and Textiles personnel are currently identifying what items are in the percentage increments and what can be done to improve the backorder position on these items. The reason that the net demand line figure remains constant at 187,851 for 40 percent of the items through 100 percent of the items is that DPSC-T's generic management system rolls demand to the generic and counts backorders against items.

Table 6. DPSC - Clothing and Textiles Demand Frequency and Backorders
(August 1981)

% NSNs	# NSNs	Net Demand Lines	# Materiel Obligations	Materiel Obligations
1	279	60,082	7,073	37.5
5	1,398	130,244	13,085	69.5
10	2,796	158,615	15,961	84.8
20	5,592	178,820	17,947	95.3
30	8,388	185,729	18,532	98.4
40	11,184	187,851	18,689	99.3
90	25,164	187,851	18,755	99.6
100	27,960	187,851	18,818	100.0

e. DPSC - Medical (DPSC-A). DPSC-A used a special computer program to develop Medical demand frequency and backorder statistics. One percent of the items incur two percent of the materiel obligations. These items generate 56 percent of the net demand lines. Thirty percent of the items experience 70 percent of the materiel obligations. This percentage of items generates 99 percent of the net demand lines. Medical personnel are currently identifying what items are in the percentage increments and what can be done to improve the backorder position on these items.

Table 7. DPSC - Medical Demand Frequency and Backorders
(August 1981)

% NSNs	# NSNs	Net Demand Lines	# Materiel Obligations	Materiel Obligations
1	13	832,954	122	[illegible]
5	68	1,228,232	[illegible],045	21.8
10	137	1,359,556	[illegible],547	[illegible]
20	275	1,436,605	[illegible],5[illegible]	[illegible]
30	413	1,460,289	[illegible],3[illegible]	[illegible]
40	551	1,470,869	[illegible],3[illegible]	[illegible]
60	827	1,477,990	[illegible],4[illegible]	[illegible]
80	[illegible],103	1,479,603	[illegible],740	98.8
100	1,379	1,479,920	[illegible],793	100.0

f. DCSC. DCSC derived its demand frequency and backorder statistics from its SMCC Report. The SMCC listing is divided between essential items (weapons systems support and Fleet Issue Load List (FILL)) and nonessential items. The SMCC listing is further divided by item characteristics: Very Important Program (VIP), High Value, Medium Value, and Low Value. These statistics indicate that the High Value items experience a disproportionate share of the backorders. Within the High Value category, items with the largest number of requisitions during the year also have a disproportionately large share of the backorders. High Value essential items generate 22 percent of the backorders in these categories. High Value nonessential items incur 25 percent of the backorders.

Table 8. DCSC Demand Frequency and Backorders
(31 August 1981)

Essential Items
(Weapons Systems Support and FILL)

Item Characteristic	Demand Frequency	% of Items	Total Backorder Lines (BB & BV)	%
VIP	716+	.18	1,151	3.2
	421-715	.18	144	.4
	0-420	.14	284	.8
High Value	241+	.52	911	2.6
	121-240	.66	1,517	4.3
	0-120	5.03	5,486	15.5
Medium Value	126+	1.01	238	.7
	51-125	1.96	346	1.0
	0-50	9.79	2,399	6.8
Low Value	25+	1.34	97	.3
	13-24	1.90	200	.5
	0-12	4.52	400	1.1

Nonessential Items

VIP	526+	.18	1,571	4.4
	236-525	.04	67	.2
	0-235	.12	680	1.9
High Value	241+	.66	1,381	3.9
	121-240	1.05	1,261	3.6
	0-120	7.40	6,376	17.9
Medium Value	51+	4.53	1,655	4.7
	21-50	7.89	2,218	6.2
	0-20	18.52	4,123	11.6
Low Value	13+	5.36	1,003	2.8
	5-12	8.19	788	2.2
	0-4	18.83	1,197	3.4
TOTAL		100.00	35,599*	100.0

* This number does not include all of DCSC's backorders as the records under zero demand frequency and the codes which do not allow for a frequency breakout.

3. Dollar Value of Demand vs. Backorders. The data in the following tables highlight the fact that for all the hardware Centers (DCSC, DESC, DGSC, DISC) the items with a high value of annual demand have a disproportionate number of lines on backorder. This corresponds to the relationship between high demand frequency and high numbers of backorders.

a. DLA Summary. The DLA summary statistics for the hardware Centers (DCSC, DESC, DGSC, DISC) were obtained from DLA-O. These statistics show that High Value items have 42 percent of the requisitions, 54 percent of the backorder lines, 4 percent of the stocked items, and 23 percent of the number of items with backorders. Since High Value items are only 4 percent of the items, the high percentage of backorder lines (54 percent) attributed to these items is definitely disproportionate.

Table 9. DLA Summary Statistics Dollar Value of Demand and Backorders
(Hardware Centers)

	Requisitions (000)	%	Backorder Lines	%	Stock Items Managed	%	# Items with Backorders	%
High Value	6,385	42.1	194,100	54.3	52,800	4.3	23,000	23.1
Medium Value	5,125	33.8	75,300	21.1	162,500	13.1	26,000	24.0
Low Value	3,005	19.8	60,100	16.8	424,500	34.2	33,800	31.3
NSO	658	4.3	27,900	7.8	600,800	48.4	23,300	21.6
TOTAL	15,173	100.0	357,400	100.0	1,240,600	100.0	108,100	100.0

High Value - Items with an annual demand value over $4,500.

Medium Value - Items with an annual demand value of more than $400 but less than or equal to $4,500.

Low Value - Items with an annual demand value of $400 or less.

NSO - Numeric Stockage Objective items have less than three requisitions during a 12-month period or have less than 12 units requisitioned during a 12-month period

b. DGSC Dollar Value of Demand vs. Backorders. The DGSC statistics highlight the fact that 10 percent of the stocked items managed are High Value and that they generate 76 percent of the lines on backorder.

Table 10. DGSC Statistics Dollar Value of Demand and Backorders

	Requisitions (000)	%	Backorder Lines	%	Stocked Items Managed	%	# Items with Backorders	%
High Value	1,588	66.8	45,800	76.1	10,900	10.4	4,400	38.6
Medium Value	540	22.7	7,700	12.8	21,400	20.3	2,800	24.6
Low Value	222	9.4	3,500	5.8	37,400	35.6	1,900	16.7
NSO	27	1.1	3,200	5.3	35,500	33.7	2,300	20.1
TOTAL	2,377	100.0	60,200	100.0	105,200	100.0	11,400	100.0

c. DISC Dollar Value of Demand vs. Backorders. The DISC statistics highlight the fact that three percent of the stocked items managed are High Value and they generate 51 percent of the lines on backorder.

Table 11. DISC Statistics Dollar Value of Demand and Backorders

	Requisitions (000)	%	Backorder Lines	%	Stocked Items Managed	%	# Items with Backorders	%
High Value	1,733	30.6	78,700	51.1	15,000	3.2	9,700	22.3
Medium Value	2,221	39.2	42,400	27.5	63,100	13.3	14,400	33.2
Low Value	1,514	26.8	25,100	16.3	262,800	55.6	14,100	32.5
NSO	192	3.4	7,900	5.1	131,900	27.9	5,200	12.0
TOTAL	5,660	100.0	154,100	100.0	472,800	100.0	43,400	100.0

d. DESC Dollar Value of Demand vs. Backorders. The DESC statistics highlight the fact that three percent of the stocked items managed are High Value and they incur 42 percent of the lines on backorder.

Table 12. DESC Statistics Dollar Value of Demand and Backorders

	Requisitions (000)	%	Backorder Lines	%	Stocked Items Managed	%	# Items with Backorders	%
High Value	1,582	36.7	38,300	42.5	14,800	3.0	5,100	14.1
Medium Value	1,453	33.6	12,800	14.2	50,200	10.1	3,300	9.1
Low Value	968	22.5	27,400	30.4	96,800	19.6	15,200	42.0
NSO	301	7.0	11,600	12.9	332,500	67.3	12,600	34.8
TOTAL	4,304	100.0	90,100	100.0	494,300	100.0	36,200	100.0

e. DCSC Dollar Value of Demand vs. Backorders. The DCSC statistics highlight the fact that seven percent of the stocked items managed are High Value and they experience 59 percent of the lines on backorder.

Table 13. DCSC Statistics Dollar Value of Demand and Backorders

	Requisitions (000)	%	Backorder Lines	%	Stocked Items Managed	%	# Items with Backorders	%
High Value	1,482	52.3	31,400	59.0	12,100	7.2	5,800	33.9
Medium Value	911	32.2	12,500	23.5	27,800	16.5	5,500	32.2
Low Value	301	10.6	4,100	7.7	27,500	16.4	2,600	15.2
NSO	138	4.9	5,200	9.8	100,800	59.9	3,200	18.7
TOTAL	2,832	100.0	53,200	100.0	168,200	100.0	17,100	100.0

4. Backorder Data on New/Provisioning Items. In response to the Director's note of 11 August 1981, the review team requested that each ICP, using available data, identify and quantify backorders on new/provisioning items. Each ICP approached the task differently.

a. DGSC. Since DCSC has a SMCC category for new items, it used its SMCC report to provide the required data. As of 31 August 1981, the DGSC data were:

2,858 items coded new/provisioning

711 BB lines

31 BV lines

742 total backorder lines

1.2% of total DGSC backorder lines

b. DISC. DISC, using the provisioning trailer to its SMCC Report, reported the following as of 31 August 1981:

5,722 items coded new/provisioning

1,390 total backorder lines

.9% of total DISC backorder lines

c. DPSC-T. DPSC-T used a special computer program to derive Clothing and Textiles statistics on new/provisioning items. These figures show that the top one percent of the items with demand had [illegible] percent of the materiel obligations. However, these items generate 51 percent of the net demand lines. Ten percent of the items experience 92 percent of the materiel obligations. This percentage of items generates almost 100.0 percent of the net demand lines. Again, the issue the net demand lines figure remains

constant at 8,437 for 10 percent of the items through 100 percent of the items is that DPSC-T's generic management system rolls demand to the generic and counts backorders against items. These statistics also show that items with the most demand are the items that incur most of the materiel obligations. Clothing and Textiles personnel are currently identifying those items that are generating the most backorders.

Table 14. Clothing and Textiles Data on New/Provisioning Items
(August 1981)

% NSNs	# NSNs	Net Demand Lines	# Materiel Obligations	Materiel Obligations
1	36	4,308	0	0.0
5	184	7,976	467	76.4
10	369	8,437	563	92.1
20	739	8,437	581	95.0
30	1,109	8,437	587	96.0
40	1,478	8,437	595	97.3
80	2,957	8,437	607	99.3
100	3,697	8,437	611	100.0

d. DPSC-A. DPSC-A used a special computer program to derive Medical statistics on new/provisioning items. These statistics exhibit the fact that the top one percent of the items demanded had three percent of the materiel obligations. These items generate eight percent of the net demand lines. Twenty percent of the items have 67 percent of the materiel obligations. This percentage of items generates 96 percent of the net demand lines. These figures support the idea that the items with the most demand produce the most lines on backorder. Medical personnel are currently identifying those items that are generating the most backorders.

Table 15. Medical Data on New/Provisioning Items
(August 1981)

% NSNs	# NSNs	Net Demand Lines	# Materiel Obligations	Materiel Obligations
1	5	8,381	43	2.7
5	25	91,564	473	30.6
10	51	95,710	657	42.6
20	102	100,934	1,033	67.0
30	153	101,976	1,241	80.5
40	205	102,977	1,345	87.2
60	307	103,855	1,476	95.7
80	410	104,197	1,527	99.0
100	513	104,317	1,541	100.0

e. [illegible]. DPSC, using a special program, did information dated 31 August 1981, developed statistics on new/provisioning items. In column one the 25,999 item [illegible] data management assumed of two years or less. In column two the 59,793 items had to age to item code new and [illegible] management assumed of two years or less. The difference between the statistics demonstrates that, when an item [illegible] changes the age of item code from new to established because [illegible] the number of backorders increases. This increase occurs

because, even though the item has been managed less than two years, when the age of item code is changed, the item is no longer protected with a 2-month safety level.

Table 16. DESC Data on New/Provisioning Items

	Column 1 Data Based On Date Management Assumed		Column 2 Data Based On Age of Item Code	
		% of Total DESC items		% of Total DESC items
Total Items	75,988	9.9	69,693	9.1
Items Coded Provisioning	25,459	3.3	22,669	3.0
Items Coded Provisioning Having Backorders	2,396	0.3	1,781	0.2
Items Not Coded Provisioning	50,529	6.6	47,024	6.1
Items Not Coded Provisioning Having Backorders	4,684	0.6	3,857	0.5
For Items Coded Provisioning		% of Total DESC Lines		% of Total DESC Lines
BB Backorder	6,430	6.9	3,251	3.5
BV Backorders	464	0.5	333	0.4
TOTAL Backorders	6,894	7.4	3,584	3.9
For Items Not Coded Provisioning		% of Total DESC Lines		% of Total DESC Lines
BB Backorders	6,422	5.3	2,068	1.7
BV Backorders	5,232	4.3	4,387	3.6
TOTAL Backorders	11,654	9.6	6,455	5.3

t. DCSC. DCSC did not have any source of data relating directly to new/provisioning items. Using data extracted during March of 1981, DCSC prepared a study covering stocked items that related items coded provisioning to the date on which DLA acquired management. These data directly reference items coded provisioning and indirectly reference new items through the fact that management was assumed within the last 24 months.

Table 17. DCSC Data on New/Provisioning Items

	Items Coded Provisioning Backorders	%	Items Not Coded Provisioning Backorders	%	TOTAL Backorders	%
Management Acquired Within Last 12 Months	1,793	3.8	1,593	3.4	3,386	7.2
Management Acquired Within Last 13-24 Months	2,460	5.2	2,420	5.2	4,880	10.4
Management Acquired Over 24 Months Ago	2,213	4.7	36,451	77.7	38,664	82.4
TOTAL	6,466	13.7	40,464	86.3	46,930	100.0

III. WAYS TO REDUCE BACKORDERS.

A. General. All of the causes of backorders can be summarized as a failure to have sufficient issuable stock on hand at the time of demand. In theory, that failure could be eliminated if we had perfect knowledge of future demand plus the knowledge, ability, and money to obtain stock in time to meet that demand. However, in practice, some failure must always exist since we manage over 1.9 million items with numerous and varied applications for which demand always has an element of uncertainty and for which procurement is conducted with thousands of vendors in volatile market places and under resource and legislative restrictions. In this environment, backorders can only be reduced, never eliminated. In seeking ways to reduce backorders, the review team relied on information collected in its interviews with the PSEs and ICPs and in its literature search as well as on its own knowledge in the subject areas.

B. Demand Forecasting. As shown before, failure to accurately predict surges in demand is the leading cause of backorders. Consequently, each ICP listed forecasting as an area for improvement but an area in which they had few recommendations. This is understandable since demand forecasting is a highly complex area. Based on its own knowledge of forecasting, the review team examined how to improve demand forecasting from a number of directions.

1. Statistics. Before discussing how to improve demand forecasting, it would be appropriate to quantify the problem. DLA has no information system that provides data on the accuracy of its demand forecasts. The review team asked the ICPs about the accuracy of their forecasts and received the following responses:

DGSC. DGSC thinks their forecasts are good with the exception of low demand items for which DGSC has initiated annual forecasting.

DISC. Although DISC does not think that current forecasting is inadequate, it feels that improvements could be made.

DPSC. Medical feels that their forecasts are generally satisfactory with the exception of handling seasonal items. Clothing and

Textiles relies on program data in making its forecasts and, therefore, has the position that its forecasts are only as good as the program data from the Services.

DESC - Forecasting is, and has been, a concern at DESC for several years, particularly the forecasting of items migrating between dollar value categories generating backorders or long supply.

DCSC - DCSC reports that their forecasts are poor and do not keep up with demand.

None of the ICPs provided statistics on the accuracy of their forecasts. This is understandable since the difference between the forecast error associated with a forecasting model and normal demand variance is not discernable.

Recently DLA-LO used historical supply control files (SCFs) to compare the forecast at a point in time with the actual demand which then occurred. The comparison was made only for replenishment items. It showed that only 10 percent of the items had forecasts within 10 percent of actual and 60 percent had forecasts over 50 percent. Although the use of percentages in this case may over exaggerate the error, e.g., an item with a forecast of 4 and a demand of 3 had a 25 percent error, the size of DLA's forecasting problem appears to be large.

2. Forecasting Models. In seeking ways to get better forecasts, the review team first looked at improving DLA's current forecasting technique. Improvement in this area should be possible in light of the significant advances in the field of forecasting in the last 15 years. Moreover, such an improvement would be highly desirable since it could be implemented within the automated system and, therefore, not require significant manpower or stock fund dollars.

a. Techniques. In approaching forecast modelling, we must begin by defining forecasting as the analysis of time-series; i.e., sequences where the data is time dependent. In the analysis of time-series, new techniques are continually being developed and older ones expanded for greater precision. Three perspectives arise in the analysis of time-series; namely:

(1) the entire past of the series,

(2) the influence of new data, and

(3) the effect of exogenous factors.

Techniques differ on how to balance these perspectives. The possible techniques can be classified as follows:

(1) Naive (e.g., moving averages and rates of change),

(2) Deterministic (e.g., polynomials in time and growth curves),

(3) Ad hoc (e.g., exponential smoothing, adaptive smoothing, and the Holt-Winters model),

(4) Classical decomposition (e.g., Census X-II and the FORTRAN system),

(5) Regression analysis,

(6) Econometric methods,

(7) Autoregressive Integrated and Moving Average (ARIMA) (Box-Jenkins),

(8) Bayesian statistics,

(9) State-space analysis,

(10) Pattern recognition, and

(11) Delphi estimates.

The specific technique for any given situation is dependent on the term of the forecast (short, medium, or long) and on the data available.

b. Studies In-Process. Currently, the DoD, through the Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics) (OASD(MRA&L)), has contracted with Boeing Computer Services (BCS) to perform a forecasting study with the Services and DLA as participants. The BCS study was the result of the "DoD Stockage Policy Analysis Report" which listed demand forecasting as an area for improvement and standardization. In addition to demand forecasting, the BCS study will look at forecasting in the areas of leadtimes, repair cycles, and returns. DLA-LO is conducting its own forecasting study and has let a contract with Inductive Inference, Inc., for assistance. The DLA-LO study was initiated at the request of the Subsistence Program Manager (DLA-LF), who was concerned that current SAMMS forecasting does not consider seasonality which is often associated with subsistence items. Although the DLA-LO study is concerned with subsistence items, its findings could be applicable to other DLA commodities. Appendix H contains the study plan for the DLA-LO study. In view of the importance of forecasting to reducing backorders, that plan may need to be expanded to include an analysis of all aspects of SAMMS forecasting.

c. Forecasting Models in the DoD. No DoD directive or instruction exists that specifies a method of demand forecasting for DoD Components. However, as documented in the "DoD Stockage Policy Analysis Report," the components have elected to use variants of weighted averaging. They are:

Army	Arithmetical averaging methods.
Air Force	Arithmetical averaging methods.
Navy	Exponential smoothing methods for comprogram related items; and Arithmetical averaging methods for program related items.

DLA — Double exponential smoothing with a tracking signal.

d. Forecasting Model in DLA. As shown above, DLA currently uses in SAMMS double exponential smoothing with a tracking signal. Exponential smoothing is a technique of averaging or smoothing current demand with past demand to arrive at a prediction for future demand. Double exponential smoothing is a doubling of the smoothing technique to account for trends in demand. The tracking signal is a technique to change the smoothing weight for items whose demand is outside confidence limits placed on predicted demand. Both double exponential smoothing and the tracking signal are correctors versus predictors. That is, neither is structured around what causes demand; rather they adjust or correct past demand forecasts with current data. Such techniques are only useful as long as they predict demand within some desired degree of accuracy. Given the statistics on forecast error presented earlier, the review team has reservations that a reasonable degree of accuracy is being achieved.

(1) Current ICP Variations. Only DISC reported to the review team any variation from standard SAMMS forecasting. DISC has what it calls variable quarterly forecast (VQF) support for its items by the DISC SMCCs. In this program, DISC applies VQF support factors to SMCC-grouped NSNs to optimize system stock availability and control stock fund expenditures, while emphasizing weapons and FILL item support. The technique is to apply different factors (e.g., 1.2, .6) to the forecasts before computing requirements levels. Again, this technique is not structured around what causes demand and only has utility as long as the VQF factors adjust demand to the desired goals.

(2) Short-Term Improvements. The current weakness of our forecasting techniques, no structure, cannot be solved in the short-term. However, our forecasting could possibly be refined with the application of DISC's program to other ICPs.

(3) Long-Term Improvement. The DLA-LO study is scheduled for completion in October 1982. It will test all applicable forecasting techniques as well as combinations of techniques. Based on its evaluation and extensions to SAMMS, it will offer recommendations on what models DLA should forecast within the future.

3. Use of Program Data. One forecasting technique is extrinsic or technological forecasting; i.e., forecasting with indicators of cause-effected relationships rather than with demand history. The use of program data in forecasting is extrinsic forecasting. Perhaps this is one way to improve DLA forecasting.

a. Definition of Program Data. Program data is any data, other than historical demand, that relates to the amount of demand which could be predicted for the future. Types of program data include air craft flying hours, number of depot overhauls, troop strength, number of exercises or mobilization exercises, etc. An example of how program data could be used would be: If two Z knobs are demanded for every jeep overhaul and 100 jeeps are to be overhauled, then we can expect a demand of 240 Z knobs.

b. Service Use of Program Data. For selected items, the Services use program data to forecast demand. The following synopsis was extracted from the "DoD Stockage Policy Analysis Report:"

Army

Program data is used throughout the life of all items to include a system phase-out date beyond which no further requirements are forecasted. The Army is the only component to utilize the phase-out date for limiting forecasted requirements.

Air Force

Program data is used throughout the life of all investment items and for selected expense items when the projected program deviates by plus 15 percent or minus 10 percent from the past two-year average. Those expense items not meeting the deviation criteria are projected by straight line past demand.

Navy

Program data is used throughout the life of all aircraft investment items except ground support equipment (GSE). All other aircraft items except GSE use program data during the demand development period (normally two years), after which single exponential smoothing is used. Aircraft support equipment is initially procured on a program data base. However, the program relationship is not retained during a demand development period. Ship parts, in general, do not use program data during demand development and subsequent support periods; however, single exponential smoothing is applied.

c. DLA Use of Program Data. DLA has long recognized the utility of program data to forecast future requirements. DPSC-T uses projected troop and fleet strengths to adjust forecasts for program oriented items (e.g., [illegible]). SAMMS also has the capability to use program change factors to adjust forecasts for replenishment items. The program change factors are to reflect changes in personnel strength, number of flying hours, and so forth, which may affect the expected demand. However, this feature of SAMMS has never been tested nor used with actual data. Finally, DLA is a strong advocate of the use of special program requirements (SPRs), which are the ultimate form of program data.

(1) Program Oriented Items. Chapter [illegible] of DLA 4140.2, Supply Operations Manual, Defense Supply Center Operating Procedures, Volume [illegible], [illegible] DSC-T use of program data for program oriented items. The procedures involve adding demand oriented requirements to program oriented requirements to arrive at the total requirement for program oriented items. Demand oriented requirements are computed with the normal double exponential smoothing technique using only the demand from customers not identified to selected service programs. Program oriented requirements are computed as

replacement factors (average of last four quarters demand from customers identified to service programs) multiplied by the planned induction/strength data.

(2) Program Change Factors. Chapter 53 of DLAM 4140.2, Volume II, documents the use of program change factors. The procedure involves multiplying the quarterly forecast by the program change factor for the quarter. The procedure has never been used.

(3) Special Program Requirements (SPRs). Chapter 58 of DLAM 4140.2, Volume II, documents the use of special requirements. The procedure includes SPR procedures whose policy basis is established in DoD 4140.22-M, Military Standard Transaction Reporting and Accounting Procedures, as well as procedures for other nonrecurring requirements. The purpose of the SPR program is to allow customers who have knowledge of their future needs to pass that knowledge to the supplier to guarantee fulfillment of those needs. In doing this, backorders are avoided on SPR demands and on other demands which would have occurred as SPR demands exhaust on-hand assets. DLA is currently working to upgrade its SPR program by relaxing its restrictions on SPR submissions.

(4) Improving the Use of Program Data. In discussing the use of program data with the ICPs, the review team found that the ICPs were lukewarm to the idea. This is understandable since program data is more directly related to retail levels of inventory and the use of program data introduces an accuracy problem with program data. The latter was cited by DPSC-T, a DLA commodity using program data. However, the review team feels that DLA's use of program data could be improved as follows:

(a) program oriented items could be identified and procedures applied for commodities other than DPSC-T;

(b) the computation of replacement factors for program oriented items should be reviewed to determine if it can be improved;

(c) program data currently used in the Services' forecasts should be examined for possible application to program oriented item procedures or to the program change factor procedures; admittedly, this may be difficult; and

(d) the procedures for program change factors should be tested with actual data before they are used.

4. Demand Variance. Demand forecasting involves the computation of the expected mean demand and the computation of demand variance. Demand variance across leadtime is a key element in the computation of safety levels. The only system-wide statistic on demand variance is the SAMMS system constant. The system constant is the sum across all items of the dollar value of demand variance over a leadtime and is used in the computation of safety levels. The ICP system constants are:

DCSC	$101,830,117	
DESC	$115,120,416	
DGSC	$114,919,737	
DISC	$174,287,489	
DPSC-A	$ 36,089,739	Source: E-D-2 Report

Currently, DESC is working on a new estimator of leadtime demand variance which so far has been promising in simulation tests. If DESC's new estimator proves successful, it will be applied to other DLA commodities.

5. Item Grouping for Purposes of Demand Forecasting. As described above, SAMMS uses a single forecasting technique for replenishment items with the exception of DPSC-T program oriented items. Given the numerous and varied applications of the items managed by DLA and using different techniques for different item groups should improve our forecasting performance. The questions which arise in grouping items for forecasting are how to group, what techniques to use for each group, and when to forecast each group. The theme of grouping should be marshalling resources and techniques to achieve the greatest payback as illustrated on the table below.

LEVEL OF FORECAST EFFORT

Item's Impact on ICP Performance

		Low	Medium	High
Item's Impact on Economics	Low	L	M	H
	Medium	L	M	H
	High	M	H	H

L = Low M = Medium H = High

b. Service Use. From the DoD Stockage Policy Analysis Report, the review team extracted the following:

Navy

The Navy uses a Mark system for categorizing items. The system divides items on the basis of value of annual demand and demand frequency into five categories (Mark 0 through Mark IV). An item's Mark category determines how its variance of leadtime demand is forecasted and what filters are placed on demand observations.

Army

The Army's demand forecasting procedures depend upon the management intensity given an item. Items with low annual dollar value of demand (<$5,000) use all of their demand to form an average demand rate. Items with high dollar value (>$5,000) may have overhaul demands forecasted separately and combined with an average demand rate for all other demands.

Air Force

The Air Force demand rate forecast is based on a single moving average of the past two years' demands. On a selective basis, program data is applied to item forecasts.

b. DLA Grouping of Items for Forecasting. DLA uses a number of approaches to group items for forecasting. DPSC-T groups their items by generic (e.g., T-shirt, all sizes) and forecasts demand for the generic which is then broken down to specific items using size tariffs. SAMMS also provides for VIP or non-VIP item categories which calls for monthly or quarterly forecasting. In addition, SAMMS includes a level of nonrecurring demand in item forecasts depending on the item's dollar value of annual demand. Finally, low demand items which do not have 3 demands for 12 units can be classified NSO items and although stocked, they are not subjected to normal forecasting and requirements computations.

(1) Generic Forecasting. Chapter 25 of DLAM 4140.2, Volume II, documents the DPSC-T use of generic forecasting for program oriented items. The procedure involves the use of size tariffs to divide the generic forecast to item forecast. DPSC-T has had some difficulty maintaining the tariff and attributes 6.1 percent of its backorders to tariff turbulence. However, the performance of the tariff appears satisfactory in face of the large number of items in a generic (sometimes over 100 items) and the small forecasts being divided (in some cases rounding significantly affects the forecasts assigned to items).

(2) VIP Forecasting. SAMMS has always had the capability to designate an item VIP and, thereby, assign monthly forecasting. In addition, SAMMS now provides for monthly forecasting without the VIP designation. The reason for this capability is the assumption that increasing the frequency of forecasting improves the forecasts. However, this assumption may not always be correct as increased frequency is more adept to pick up random variance in demand and treat it as part of a trend. DGSC recognized this and has opted for annual forecasting of low demand items whose random demand variance could unnecessarily impact forecasts.

(3) Percent of Nonrecurring Demand. In SAMMS, low and medium value items are 100 percent of their nonrecurring demand in their forecasts. For high value items, individual item percentages are computed by dividing the sum of the two lowest quarters of nonrecurring demand by the sum of the last four quarters of nonrecurring demand.

(4) Improving Grouping for Forecasting. The review team believes that grouping for forecasting could be improved as follows:

(a) Items should be grouped according to their impact on performance and economics and different levels of forecasting effort assigned appropriately.

(b) The application of generic forecasting for items other than DPSC-T items should be considered.

(c) DGSC's annual forecasting or semiannual forecasting should be tested to determine the optimum procedures for incorporating them in SAMMS.

(d) The procedure for assigning percent of nonrecurring demand should be reviewed for possible improvement.

6. Controls on Adjusting Item Forecasts. Since demand forecasts in DLA are less than optimum, Item Managers (IMs) who are charged with the responsibility of maintaining item performance, exercise their authority to change individual item forecasts. While at the ICPs, the review team talked with some IMs and learned that their distrust for the system forecast caused them at the time of buy to compute a new forecast using the last four quarters of demand (the only historical information available to them). Since the backorders' impacts of this are unknown, the review team investigated the controls on adjusting system forecasts.

a. Service Controls on Adjusting Item Forecasts. The review team extracted the following information on Service controls on adjusting item forecasts from the "DoD Stockage Policy Analysis Report:"

> Army
>
> The demand base period may be set to 6, 12, 18, or 24 months by the IM. Average monthly demand and program requirements may be frozen up to one year.
>
> Air Force
>
> Errors in quantity or frequency of recurring demand can be corrected by the IM.
>
> Navy
>
> Recurring maintenance demand average and recurring overhaul demand may be updated by the IM. Likewise, the system requisition average may be updated by the IM.

In summary, each of the Services permit changes to forecasts at the IM level.

b. DLA Controls on Adjusting Item Forecasts. Also from the "DoD Stockage Policy Analysis Report," the review team extracted the following information levels of authority required to adjust factors involved in forecasting:

		LEVELS OF AUTHORITY			
FACTOR	DCSC	DESS	DGSC	DESC	PCSC
Period Smoothing Factor	BC	DSO	DC	IM	IM
Normal Requisition Frequency	IM	IM	IM	IM	IM
Demand Quantity	IM	IM	IM	IM	IM
Nonrecurring Percent of Demand	IM	BC	IM	IM	IM

IM - Item Manager
BC - Branch Chief
DSO - Director, Supply Operations
DC - Division Chief

c. Need for Expanded Controls. IMs must have the authority to enter knowledge which they might possess on increasing or decreasing demand or to correct forecasts which are badly out of track. However, this authority can be overused owing to a general distrust of system forecasts. Perhaps, this could be controlled by adopting the following level of authority scheme.

LEVEL OF AUTHORITY

		Item's Backorder Potential		
		Low	Medium	High
Item's Long Supply Potential	Low	IM	IM	BC
	Medium	IM	IM	BC
	High	BC	BC	DC

IM = Item Manager BC = Branch Chief DC = Division Chief

7. Communication with Prime Customers. All of the ICPs cited improved communication with prime customers as one way to improve forecasts. Although such communication can help item management, it may not yield improved forecasts. The experience of DGSC with its Customer Demand Analysis Data program illustrates why. Under this program, DGSC identified and contacted their top 100 customers and asked them for forecasts of future demand for DGSC items. The customer responses were unuseable as they responded either with the fact that they are merely passing orders from lower retail levels or with historical data which DGSC had already. The latter is understandable since retail levels rely on historical demand data to forecast future demand.

8. Customer Research. In private industry, large firms study their customers and potential customers to determine what they should manufacture. A failure to consider the future demands of their customers could translate into a crippling financial loss as illustrated in the recent experience of the American automobile industry. Although DLA does not have the profit motive, it too is in the business of meeting future customer demand. In our case, a failure to consider the future demands of our customers could translate into an expenditure of funds for materiel which will not be demanded as expected or never demanded. For this reason, the review team feels that a need exists to develop a customer research capability to provide the following:

a. Analyses of Long Term Demand Trends. Forecasts can be improved by incorporating long term trends if and when they exist. Analyses of long term demand trends could involve defining any periodicity in demand, impacts of weapons systems, phase-in and phase-out, and the shape and length of trends. For example, an analysis of demand for a class of aircraft parts could show a cyclic peak in demand every five years. That knowledge could be incorporated in the forecast for that class.

b. Analyses of New Product Demands. Forecasts can be improved by incorporating future trends in demands. There is no reason to believe that demand trends are static. In fact, fielding of new weapons systems may well initiate new trends. If in the analyses of long term trends, causes for trends are identified, that knowledge could be applied to help quantify future

trends. For example, an analysis of a new class of aircraft parts could show that they will have the same usage as the class of aircraft parts examined in the above example. In this case, the five year peak knowledge for the old class could be incorporated in the forecast for the new class.

c. Analyses of Mission Changes on Demand. Mission changes could be considered a form of program data. For example, if military exercises are to be conducted in the desert versus arctic terrain, clothing and equipment wear would be different. Although IMs may be aware of such changes, when that information is obtained and how it can be used to predict demand are important forecasting considerations.

d. Analyses of Obsolescence. Just as it is important to recognize future demand for new products, it is important to predict the obsolescence rate of old products. Although decaying demand on certain items does not deter performance on those items, it does deter overall performance by occupying funds which could be better applied to items with active demand. Obsolescence is a factor in defining procurement cycles but its current computation needs improvement (see paragraph III.E.1.e.).

C. Late Receipt of Materiel. Whenever stock on order does not arrive when expected, the potential for backorder exists. This is because stock is ordered according to the leadtime of record. If the recorded leadtime is unrealistic or if the contractor fails to deliver stock in the recorded leadtime, on-hand stocks may be exhausted and backorders accrued. As shown earlier, delinquent deliveries, extended leadtimes, and contracting difficulties are three of the top four causes for backorders. The review team examined trends in leadtimes, how they are recorded, and reasons for contract delinquencies. Contracting difficulties include pre-award problems, cancelled contracts, noncontractable purchase requests (PRs), and specification problems. These difficulties result in extended leadtimes or delinquent deliveries. For this reason, the review team did not discuss contracting difficulties as a separate topic.

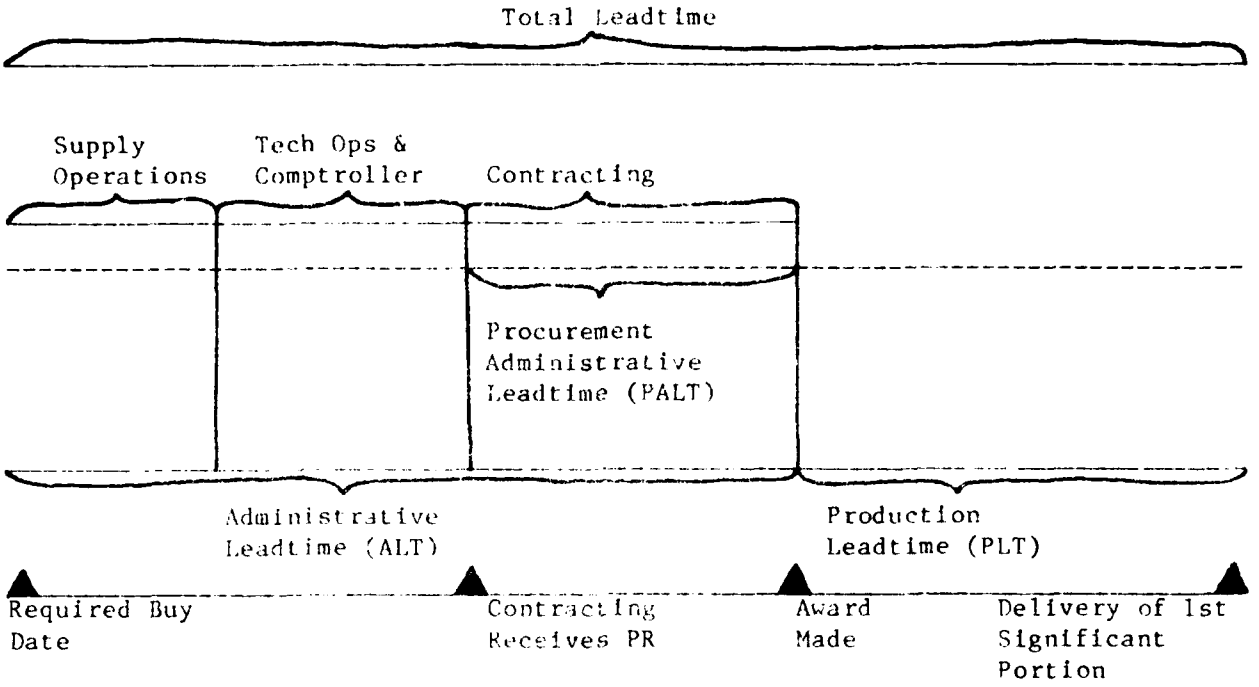
Extended Leadtimes. As listed earlier, DLA's inability to forecast extended leadtimes is the third leading cause of backorders. Leadtime has a number of components as illustrated in Figure 1. The two main components are ALT and PLT. The review team examined both and how they are recorded.

a. ALT. The first major component is the ALT defined as the time interval between initiation of the recommended buy and the date of award. The procurement administrative leadtime (PALT) is a subset of the ALT and measures the time the PR is in the Contracting Directorate.

b. Trend. Throughout DLA, ALT days and dollars committed to [illegible] increased since FY 1975 as shown in Figure 2. Dollar increases include increases due to surcharge, increases due to inflation, and increases in standard price.

Figure 1

Diagram of Leadtimes



(2) Reasons. The major causes of extended administrative leadtime are:

(a) understaffing,

(b) surge in workload usually occuring at the beginning of each quarter,

(c) specifications not available,

(d) specifications not adequate,

(e) extended period of time needed for negotiations,

(f) no response to solicitation,

(g) pre-award problems,

(h) noncontractable PRs,

(i) inflation,

(j) staff turnover, and

(k) other.

Figure 2

TRENDS IN ADMINISTRATIVE LEADTIME

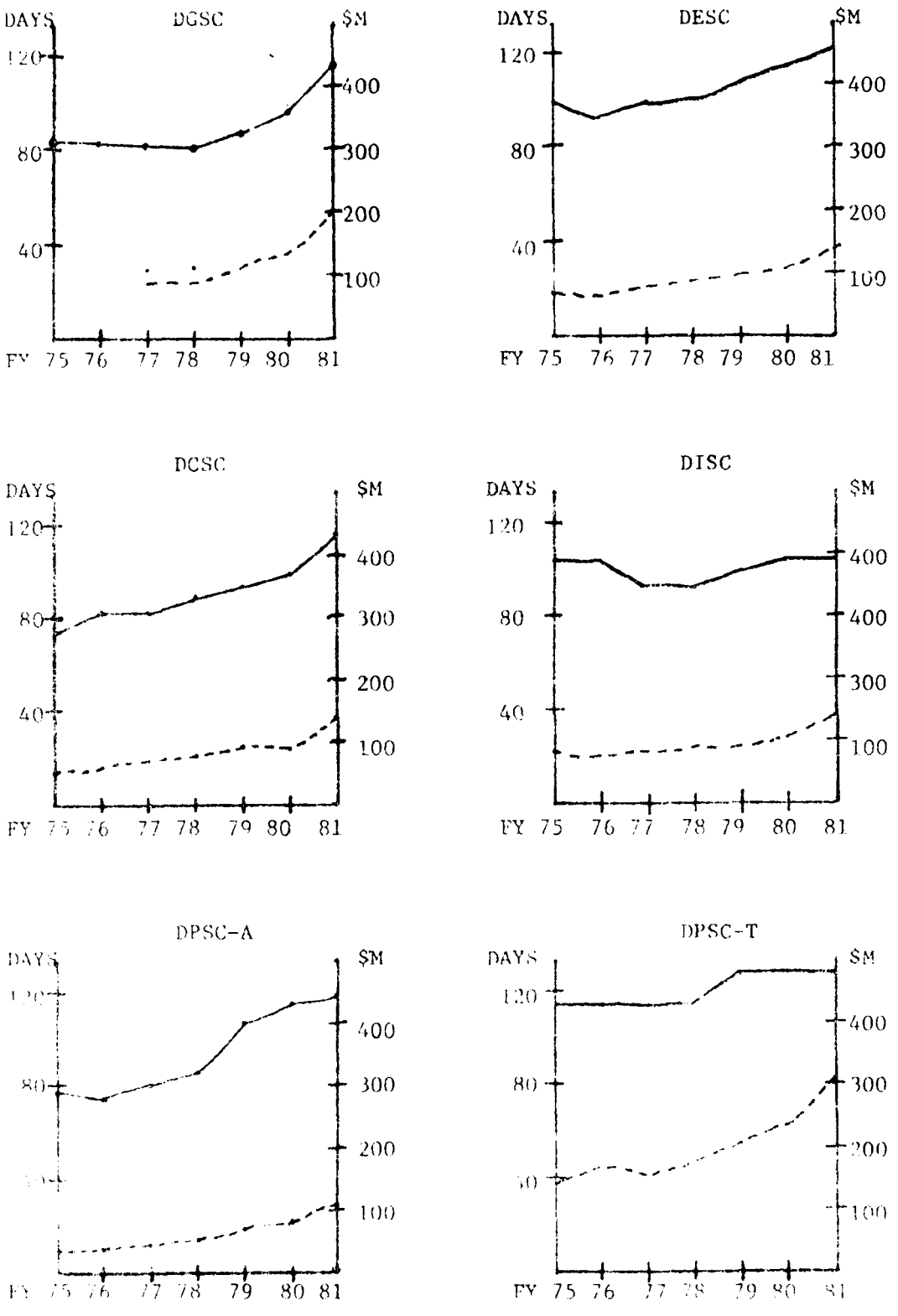
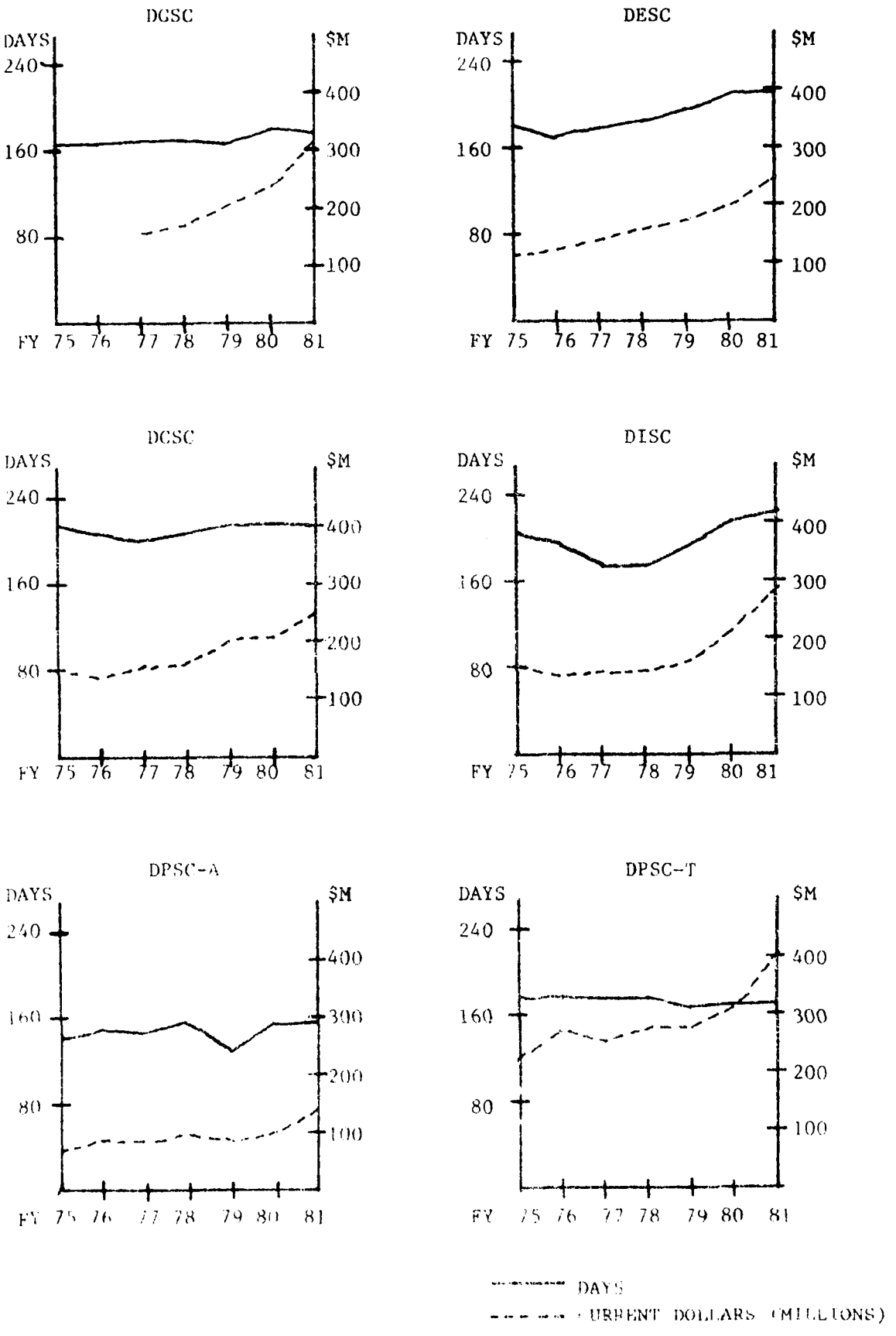


Figure 3
TRENDS IN PRODUCTION LEADTIMES



(3) Improvements. A number of recommendations for improving ALT have come up in the past; namely, additional personnel, more automation, workload leveling, and changing thresholds for large and small purchases for SASPS I and SASPS II. A recent study performed by the Logistics Management Institute (LMI) entitled, "Procurement Workload versus Workforce--A Growing Imbalance," found that procurement workload increased significantly in both size and complexity between 1975 and 1980 while the procurement workforce increased at a lesser rate. The study summarized reviews of conditions at 15 DoD procurement activities. The study recommends immediate action to increase the number of procurement personnel where needed; to keep better records of work in process; to increase automation; and to develop work measurement and manpower utilization and projection systems. All of the above recommendations could improve ALT at DLA.

b. PLT. The second component of the total leadtime is the PLT. This is the time interval between the award date and date of the first significant receipt of materiel into the supply system.

(1) Trend. Throughout DLA, dollars invested in PLT have increased since FY 1975 as shown in Figure 3. Dollar increases include increases in surcharge, increases due to inflation, and increases in standard [illegible] PLTs have increased at DESC and DISC as shown in Figure 3.

(2) Reasons. Some reasons for extended PLT are:

(a) market conditions and transportation,

(b) labor disputes,

(c) competition with private enterprise for manufactured goods,

(d) reduced vendor inventories,

(e) greater reliance on manufacturers versus distributors for some items, and

(f) increased DLA role as retailer (i.e., more nonstocked items with small quantities being procured).

(3) Improvements. DLA can make improvements to affect the upward trend in PLTs. PLTs could be reduced by offering price incentives, where economical, for accelerated deliveries on negotiated contracts. PLTs could be reduced by considering manufacturers' production cycles in the buying decision. (See subparagraph III[illegible].) Another way to reduce PLT is to reduce the government caused reasons for delinquent deliveries. (See subparagraph [illegible]). Finally, an extrinsic forecasting technique for PLTs (See subparagraph [illegible]) should be tested to see if it could yield better forecasts.

c. Computations of Leadtimes. Stopping or reversing the upward trend in leadtimes is important to reducing backorders and investment in leadtime [illegible] safety levels (see table 32 for relationship between

leadtime and safety level). However, some reasons for changing leadtimes are outside DLA's control and, therefore, it is important to accurately predict those changes, especially, extended leadtime which result in backorders.

(1) Current Procedures. Chapter 32 of DLAM 4140.2, Volume II, documents the procedures for computing current ALTs and PLTs. The procedure is to smooth or average the leadtime observations from the latest representative buy into the old leadtime with a smoothing constant of .67. Except for items procured with a requirements type contract, ALTs are constrained to a minimum of 30 days. PLTs are computed twice; first with the contractor's estimated PLT at time of award and second with the actual leadtime at the time of first significant delivery.

(2) Improvements. Although the above procedure is referred to as a procedure for keeping leadtimes current, it is not. Even without the smoothing technique, using the latest leadtime for the current leadtime may be unrealistic as the latest buy will always be after the fact and may be up to three years old (given maximum procurement cycles of three years). Use of FSC leadtimes or other item group leadtimes may improve the age of the latest buy but it will not alter the fact that the latest buy is history and may not be current. Borrowing from the procedure for updating standard unit prices, possibly leadtimes could be updated with annual leadtime change factors. In the case of ALTs, the factors could be based on contracting staffing and procurement innovation. In the case of PLT, market research could be used to develop factors.

2. Delinquent Deliveries. There are primarily two basic types of reasons for delinquent deliveries: contractor caused reasons and Government caused reasons. A draft study, "An Analysis of Contract Delinquencies," dated April 1981, prepared in DLA-PRS, formed the foundation for the team's analysis of the delinquent delivery problem.

a. Contractor Caused Reasons. The contractor may cause a delinquent delivery in two ways. On the one hand, the contractor may intentionally delay delivery by placing a high profit non-Government order ahead of the Government order since he does not usually get penalized by the Government for late deliveries on small purchases. On the other hand, the contractor may actually plan to deliver the stock on time but because of reasons beyond his control or his poor management, the stock will not be delivered on time. Reasons for contractor caused delinquent deliveries are:

(1) subcontractor delays in furnishing parts,

(2) contractor overloading,

(3) raw material shortages,

(4) technical/quality problems,

(5) contractor clerical errors,

(6) shipping/transportation problems.

(7) noneconomic production runs, and

(8) labor problems.

b. Government Caused Reasons. There are a number of government caused reasons that will contribute to the late arrival of a shipment. They are:

(1) late/nonreceipt of award,

(2) government clerical errors,

(3) technical/quality problems,

(4) shipping/inspection problems, and

(5) cancelled contracts.

c. Improvements. In order to reduce delinquencies, the ICPs are currently developing a number of new programs. In addition to these programs, the ICPs also have other recommendations. Both the new programs and recommendations are listed below.

(1) New programs:

(a) Computer program to alert contractors to awards they should have received, especially for manual purchase orders.

(b) Efforts to reduce the administrative/clerical errors.

(c) Computer program to try to clear dreg-end balances, whenever possible.

(d) Program to eliminate MOCAS-SAMMS incompatibilities and improve the transmission of shipment performance notice (SPN) information.

(2) Recommendations:

(a) Abolish contractor PDDs as listed in our item records and use the contractor's best realistic delivery date, especially for DVDs.

(b) Change the F-38, "Contract Delinquency Report" to:

(1) Breakout delinquencies by PVDs and stocked items.

(2) Break out age categories in 30-90, 91-150, 151+ day groupings to increase visibility on older delinquencies.

(3) Allow selective printing of individual aging categories.

(c) Develop a policy letter to encourage ICPs not to award contracts to vendors with poor performance records.

(d) Increase use of bilateral awards.

(e) Increase use of termination for default procedures, particularly with chronically late contractors.

(f) Develop a contract clause requiring premium shipping on all late deliveries.

(g) Increase personnel resources to be used to develop new sources for sole or single source items.

(h) Increase efforts, in conjunction with Supply Operations, to minimize status and expedite requests going to the Contracting Directorate.

(i) Discontinue routine mailings of F-38 Report. Use resources to work 90+ day delinquencies and clear up erroneous delinquencies.

(j) Increase demands for monetary consideration in return for extended delivery dates; small purchases should include delinquency disincentive clauses that assess automatic monetary penalties for late delivery.

D. Investment. Increasing or decreasing the dollars to manage items should impact on the rate of backorders. However, the question is how to best allocate the dollars. Should dollars be allocated to safety level stocks to protect against increased leadtime demand or should dollars be allocated to procurement cycles to reduce the number of times an item is in a potential backorder position? Or could the dollars better be spent on ICP operations and maintenance (O&M)? The review team examined safety level investment versus backorders, procurement cycle investment versus backorders, O&M investment versus backorders, and ICP procedures for handling budget restrictions.

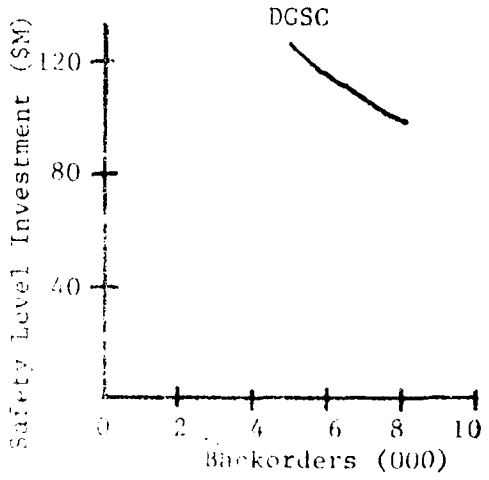
1. Safety Level Investment vs. Backorders. In computing requirements levels, the safety level is the primary protection against backorders. The review team plotted the theoretical relationship between safety level investment and backorders and historical relationships between safety level investment and numbers of backorders.

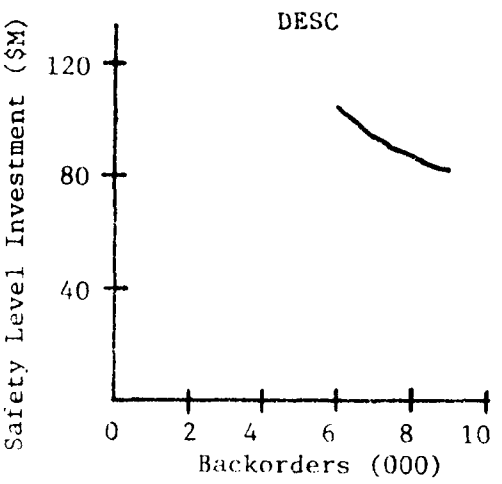
a. Theoretical Safety Level Investment and Backorders. In SAMMS, the F-062 Report lists the safety level investment for six different backorders. ICPs can use this report to set the proper backorder rate. Figure 4 plots the data on current ICP F-062 Reports.

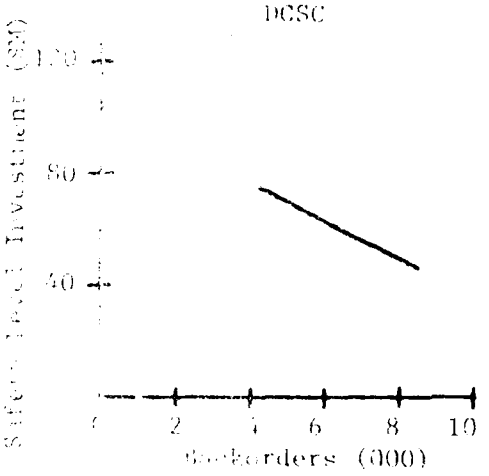
b. Historical Relationships between Safety Level Investment and Backorders. Figure 5 illustrates the historical ICP relationships between safety level dollars and backorders. In both cases, the dollars have increased over time due to inflation. The one exception is DPSC-Y who uses fixed safety levels. Since dollars are not a consideration in fixed safety levels, backorder dollars and safety level dollars need not correspond. Figure 6 illustrates the historical ICP relationships between safety level days and

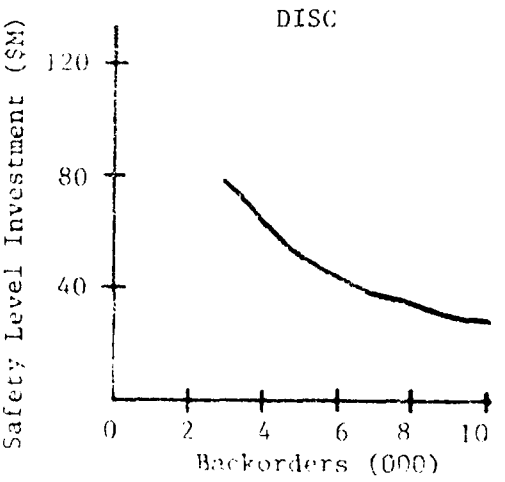
Figure 4

THEORETICAL RELATIONSHIPS BETWEEN SAFETY LEVEL INVESTMENT AND BACKORDERS









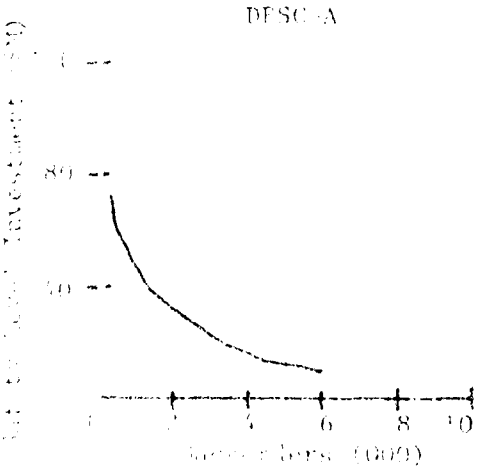


Figure 5

HISTORICAL DOLLAR RELATIONSHIPS BETWEEN SAFETY LEVEL INVESTMENT AND BACKORDERS

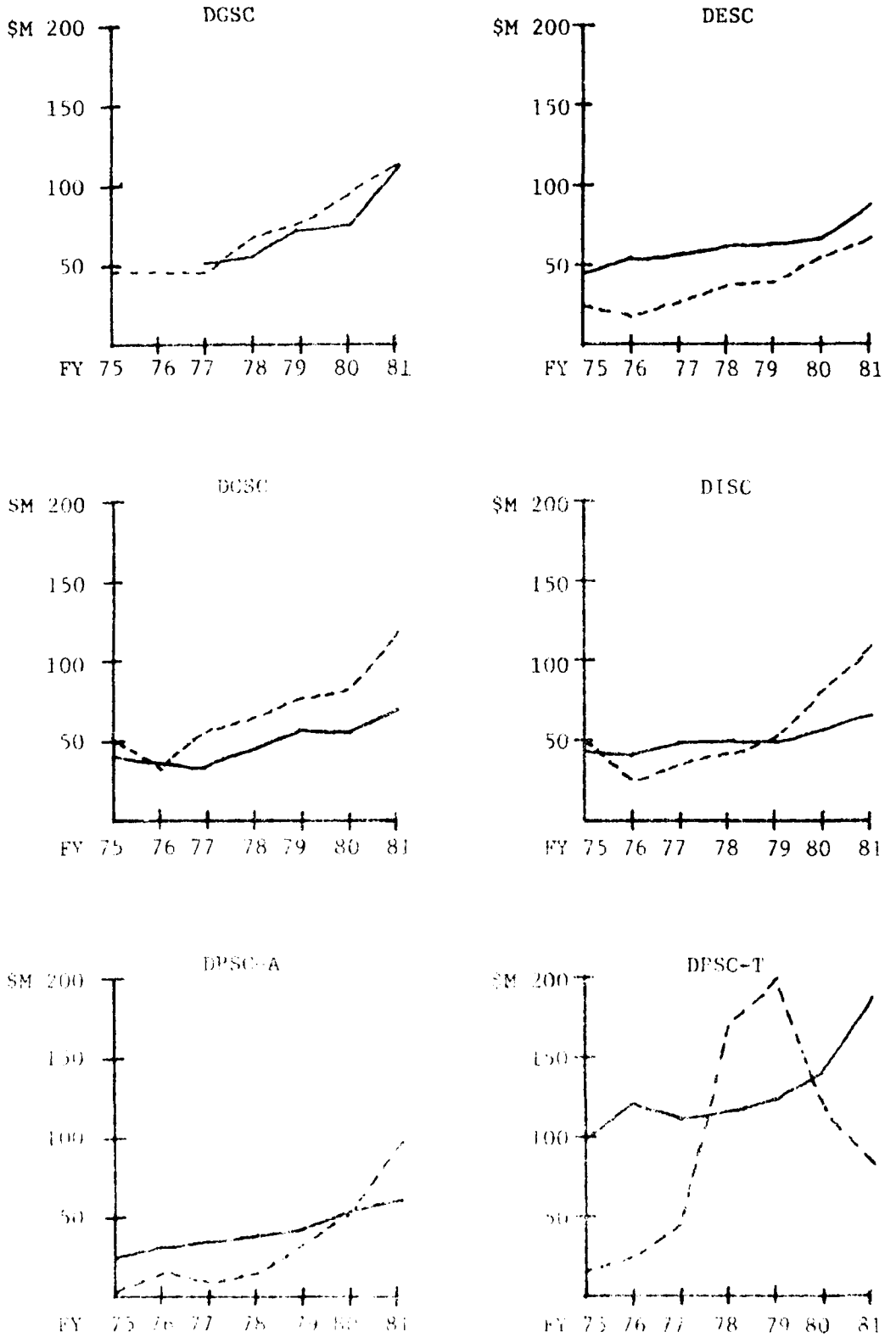
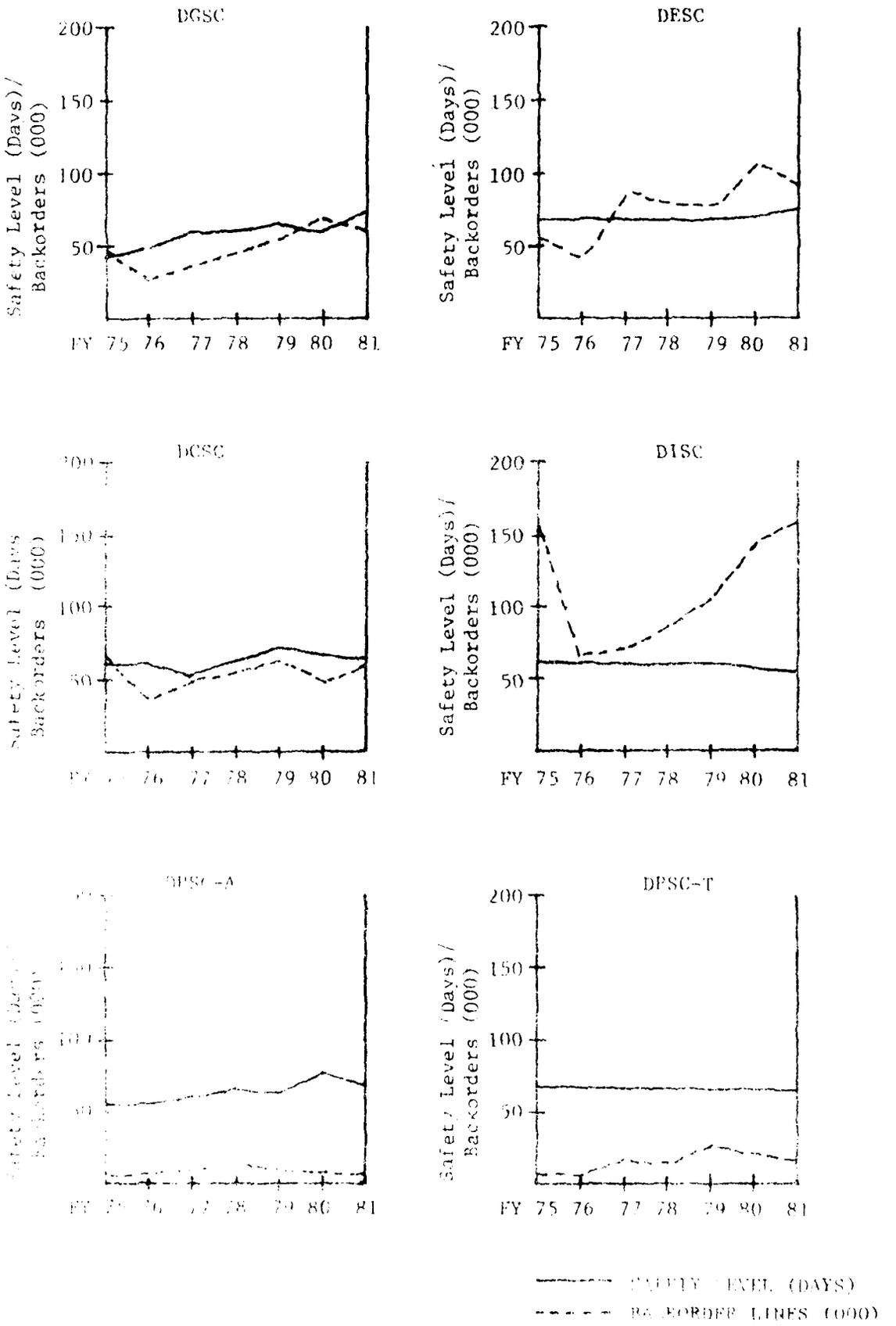


Figure 6

HISTORICAL RELATIONSHIPS BETWEEN SAFETY LEVEL DAYS AND NUMBER OF BACKORDERS



backorders. In this case, the trends do not correspond. This could be due to the fact that late receipt of materiel is not considered in DLA's safety level formula; and, therefore, safety level days are relatively constant while backorders increase.

2. Procurement Cycle Investment vs. Backorders. SAMMS uses the classical Wilson Economic Order Quantity (EOQ) to compute its procurement cycles. The objective of the Wilson EOQ is to provide optimum procurement cycle in terms of least cost. However, the size of the procurement cycle does impact on the numbers of backorders as the larger the procurement cycle, the fewer times an item is in a potential backorder position. Just as important, the size of the procurement cycle impacts on the amount of long supply and excess stock as the larger the procurement cycle, the greater probability of long supply or excess stock. Table 18 illustrates the relative relationship between procurement cycles and safety levels. The exact relationship would differ item-by-item since other item characteristics affect safety levels. DESC's operations research staff conducted a study, dated March 1981, which found that backorders could be reduced more economically through an increased investment in safety levels rather than an increased investment in procurement cycles.

3. O&M Investment vs. Backorders. The application of additional manpower resources could reduce the number of backorders; e.g., added manpower in contracting could reduce the impact of surges in procurement workload which extend ALTs. The procurement cycle computation makes the trade-off between particular O&M investment and stock fund. Figure 7 illustrates the historical relationship between ICP O&M costs and backorders. That relationship does not portray any cause-effect relationship. The review team believes that a cause-effect relationship does exist but it cannot be shown in overall statistics which bury mission changes. More importantly, the trade-offs between O&M funds, stock funds, and backorders cannot be shown with historical statistics. If these trade-offs are important, as the review team believes they are, the need exists to construct a model(s) of how funds impact on ICP performance. The model could be used to develop the needed trade-offs.

4. Procedures for Handling Stock Fund Budget Restrictions. Although DLA has rarely been faced with budget restrictions, the procedures for handling budget restrictions, if enacted, would impact on performance. The review team examined the ICP procedures and the need for improvement.

a. DGSC. DGSC has segmented its stocked items into six major groups based on average requisition [illegible]. When budget restrictions are imposed, DGSC constrains or reduces procurements in the higher cost groups.

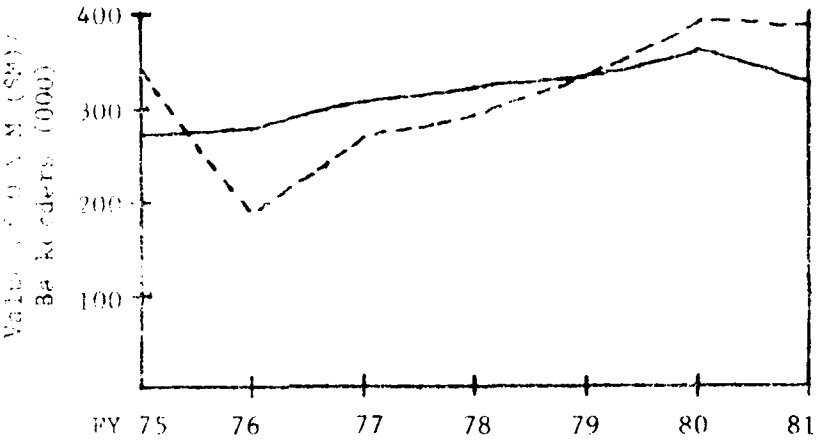
b. DESC. [illegible] groups to optimize system stock availability, and control stock fund expenditures, while at the same time emphasizing weapons systems support and [illegible] support.

c. DPSC-A. Chemical commodity managers would selectively reduce procurement cycles on items which reached the budget limit.

d. DPSC-T. Clothing and Textiles management would reduce safety levels and reduce procurement cycles.

Figure 7

O & M INVESTMENT AND BACKORDERS



——— DOLLAR VALUE OF O & M -- CENTERS ONLY (MILLIONS)

- - - - - NUMBER OF BACKORDERS ON HAND (000)

e. DESC. A simulation program is being developed by the DESC operations research staff to provide dollar/workload impacts of various possible procurement cycle alternatives on short notice in event of future fund restrictions. DESC reported that they would generally avoid budget restrictions by justification of revised requirements or, if a phasing problem, advancement against an approved program. If it is a single end-of-year shortage of small size, then their first consideration is to delay a few very large buys until 1 October, allow maximum number of PRs to process, etc., or to permit all buys to suspend for one or two cycles if necessary. Temporary restrictions are handled by selective procurement cycle reduction involving least number of items/least supply support risk possible.

f. DCSC. Depending upon the severity, DCSC would develop techniques to maximize stock availability. One technique might be to reduce review cycles and set a buy priority. Example: Cover weapons systems items first; high demand items (100 or more per year) second; if any funds left, drop to 50-99 demands per year. DCSC has available a mechanized program which attempts to maximize availability through a variable QFD concept.

(1) The program contains a management policy table which identifies groups of items to receive larger than normal QFDs so the net result is the same commitment requirements as if all items had a normal QFD.

(2) Preliminary operations research simulations are required to determine how to set the management policy table. Basically, the concept increases QFDs on low unit price/high frequency items and reduces QFDs on high unit price/low frequency items.

(3) DCSC has not used this program since December 1978. IMs tend to resist this concept when they are the manager of items which get the reduced QFDs if their performance, in part, is determined by their backorders and supply availability.

g. Need for Improvement. The review team recognized that both reducing safety levels and reducing procurement cycles are only short term solutions. The impact is temporary and may eventually have a detrimental impact on overall system effectiveness. One solution would be to use the SAMMS simulation model to test alternatives. Another solution would be to develop a single purpose simulation program similar in concept to the one DESC is developing. This program would be transportable and applicable to all commodities except Subsistence.

E. Stockage Policy Rules. Rules for determining the range and depth of stock directly impact on the number of backorders. Improper level setting could increase backorders and/or produce long supply; while proper level setting will produce the best supply performance for each dollar spent. The review team looked at improving procurement cycles, safety levels, and NSO computations; adjustments to computed levels; provisioning/new item procedures; and stock/nonstock criteria.

1. Improving Procurement Cycles Computation. DoD policy governing the computation of procurement cycles is set forth in DoD 4140.39, Procurement Cycles and Safety Levels of Supply for Secondary Items. In implementing that policy, DLA selected the Wilson EOQ which seeks to minimize the cost-to-order

and the cost-to-hold inventory. Since implementation, the DLA EOQ has come under attack and some variations have been adopted at some ICPs for some items. A discussion of these attacks and variations and of how they could be used to improve DLA's EOQ computation follows.

a. Validity of EOQ Model. Critics of the EOQ model are normally concerned with the values of factors in the model, not with the structure of the model itself. Proponents of other order quantity models, who do question the structure of the model, argue that the cost elements which drive the EOQ model are unmeasurable and the structure should be changed to use measurable costs. However, DLA-LO's examination of alternative models has shown, up to this point, that costs in these models, although sometimes framed in different language, can be directly related to the EOQ's cost-to-order and cost-to-hold. At a conference of DoD Components in January 1981 to draft a new DoDI 4140.39, no new model was proposed. Although dated, the EOQ model appears valid.

b. Stock Fund Budget Contraints. A criticism of the EOQ model is that it cannot handle budget restrictions. This is not true as budget restrictions can be handled by (1) adding budget constraints to the EOQ model or (2) applying empirical rules which approximate the effects of budget [illegible] simulation analysis to determine those rules. It is important to handle budget restrictions in the cost equation used to compute procurement cycles and safety levels since such an approach will minimize the impact of budget restrictions on backorders.

c. Procurement Constraints. Another criticism of the EOQ model is that it does not consider the size of the contracting workforce. Ideally, the EOQ model is designed to produce the optimal number of procurements and the size of the contracting workforce should be built upon that number. However, for any number of reasons, the contracting workforce may be understaffed. As in the case of budget restrictions, workforce limitations can be handled by (1) adding procurement constraints to the model or (2) applying empirical rules which approximate the effects of procurement constraints using simulation [illegible] determine those rules.

d. Cost-to-Order. A criticism of the EOQ model is that the [illegible] cost-to-order, established in 1972, is inaccurate. Several of the ICPs [illegible] conducting studies to update the cost while other ICPs are using the [illegible] in setting procurement workload. DLA-LO is conducting a [illegible] the cost-to-order using procurement costs developed by the Defense Audit Service (DAS). The DLA-LO study will also consider how different [illegible] order should be applied to groups of items which are procured differently (e.g., small purchase versus large purchase.

e. [illegible] Another [illegible] criticism [illegible] that the model is [illegible], represented by a holding rate against value of annual [illegible] costs. The holding rate is [illegible] (1) a [illegible], (2) a [illegible] percent investment cost, and (3) an [illegible] percent investment cost is not suitable [illegible] difficulty with the procedure for computing the [illegible] investment cost is real or not, [illegible] does [illegible] the private sector an interesting [illegible] for

Resource Management, that penalty is ten percent. Improvements for computing the obsolescence rate were proposed in the "DoD Stockage Policy Analysis Report."

f. Manufacturer's Production Cycles. The Navy's EOQ model includes a term for manufacturer's setup cost for those items where that cost is a cost to the Government. Although this cost may not apply to the items managed by DLA, market availability should be a consideration for DLA items obtained from manufacturers. Currently, the EOQ model assumes 100 percent market availability when in fact the market availability will vary according to the manufacturer's production cycles. At DPSC-A, the review team learned of an incident in which the ICP market research analyst discovered that a drug was only going to be available after a certain date. That information was not incorporated in the buying decision; and when a buy was initiated, the drug was unavailable. The EOQ model can be modified to incorporate market availability information from market research analysts.

g. Demand Variance. DLA's EOQ model considers demand to be static; i.e., zero variance. In implementing its model, DLA considered EOQ models with demand variance but found that the model without variance represented an approximation which performed equally as well across all items. Perhaps an EOQ model with demand variance should be applied to items whose dynamic demand patterns keep them on backorder lists.

h. Annual Buys. A simple but effective way of reducing procurement workload is making annual buys on items whose normal procurement cycles are less than 12 months. The major difficulties of annual buys are (1) that they cause early commitments of investment and (2) that they lend to increases in excess stocks in situations where demand is unstable or forecasted badly. For these reasons, the use of annual buys should be selective.

2. Improving Safety Levels Computation. Like procurement cycles, the computation of safety levels is set forth in DoDI 4140.39. The objective of the DoD safety level is to provide the maximum system-wide protection (least number of backorders on hand) for the safety level dollar. It accomplishes this by varying the amount of safety level given to individual items based on the attributes. Table 18 shows how increases in item attributes impact on the size of the safety level. The computation of safety levels has also been attacked as it permits zero safety levels on some items. There have been and there are improvements being made to the safety level based on work done at DESC. DLA-LO is currently working on ways to improve safety levels for weapons systems items. This will cause safety level dollars to be reallocated to those items and the overall number of backorders may increase. But the increase in overall backorders should be balanced by improved performance for weapons systems items. Real improvements to the performance of safety levels will occur if demand forecasting and leadtime forecasting are improved.

Table 18. Increases in Item Attributes and Size of Safety Level

Attribute (↑)	Size
Demand	↑
EOQ	↓
Demand Variance	↑
Leadtime	↑
Unit Price	↓
Number of Requisitions	↑
Average Requisition Size	↑

↑ = increases

↓ = decreases

3. Improving NSO Levels Computation. The rules for computing NSOs differ among DoD Components and among DLA ICPs. The DoD Stockage Policy Analysis Report cited the computation of NSOs as an area for improvement and standardization. However, Table 9 shows that NSO items are not major contributors to backorders and what's more, the major hurdle to improved support for NSO items is demand forecasting. Demand for NSO items is infrequent and, therefore, does not lend itself to many forecasting models. Moreover, it is unstable as items are continually migrating in and out of the NSO category. For these reasons, the review team believes that DLA can best reduce backorders for NSO items through improved forecasting rather than improved levels computation.

4. Improving Control Levels. In DLA, control levels are used to reserve stock for high priority requisitions (separate control levels are set for IPG I and II demands). Until recently, ICPs modified the use of control levels by backordering high priority requisitions for large quantities in order to issue requisitions with smaller quantities. DLA-O ordered an end to this practice as it validated Uniform Materiel Movement Issue Priority System (UMMIPS) policy to issue stock by priority and by date received. An increase in backorders is expected as this practice is put to an end. The DLA-O action was correct and necessary but the following two improvements could reduce the adverse impact:

a. Improve the Control Levels Computation. Currently, in computing control levels the system percent of priority requisitions is applied to all items and the levels remain constant throughout an item's leadtime. Some items may never have priority demands and the use of control levels in their case creates backorders. A long pending SAMMS change is in the queue to develop priority percentages by item. Moreover, reserving the same level of stock when a receipt is due in one day as when a receipt is due in a leadtime is questionable.

b. Apply Incremental Deliveries. When DESC backordered [illegible] large quantities, customers were contacted and asked if an [illegible] of [illegible] a smaller quantity could satisfy their need until the remainder of the [illegible] could be satisfied with a due-in. This procedure may also violate UMMIPS but it does improve overall customer support at no expense to any participating customer. Perhaps UMMIPS could be modified to incorporate this option.

5. Adjustments to Computed Levels. SAMMS permits the use of fixed safety levels (normally used for new items) and fixed procurement cycles. The respective levels of authority are as follows:

	Safety Level	Procurement Cycle
DCSC	HQ DLA	Item Manager
DESC	HQ DLA	Branch Chief
DGSC	HQ DLA	Item Manager
DISC	HQ DLA	Item Manager
DPSC	HQ DLA	Item Manager

In addition, the review team received the following ICP responses to its question regarding adjustments to computed levels:

DGSC

Procurement cycles were increased to annual buys for some 700 items to improve supply support. Procurement cycles were also adjusted upward if they are less than the ALT. No adjustments were made to safety levels.

DISC

DISC used the VQF support factors to adjust procurement cycles and safety levels by SMCC-grouped items. (See Appendix C, Section 4.1.)

DPSC

Medical reduced procurement cycles for items with requirements contracts and increased procurement cycles for items which require multi-year contracts. Safety levels were reduced for shelf life items. Clothing and Textiles used fixed safety levels, subject to adjustment by IMs, and fixed procurement cycles.

DESC

DESC increased procurement cycles for certain requisitions of their SMCC-grouped items. They also increased procurement cycles to take advantage of quantity discounts. Zero safety levels were assigned to all diminishing manufacturing sources (DMS) items.

DCSC

DCSC increased procurement cycles on 2,730 annual buy items and on approximately 1,500 Project CAR items. No adjustments were made to safety levels.

Since most of the above adjustments increase procurement cycles, and increased procurement cycles should reduce backorders, the effect of the adjustments should reduce backorders.

6. Provisioning/New Item Procedures. The statistics on provisioning/new item backorders in Section II.D.4. show a small percent of backorders are attributable to these items. The ICPs reported that the backorders for new items were caused by the transfer of dry or inadequate pipelines and backorders for provisioning items were caused by requisitions prior to the date of support or poor provisioning demand forecasts. The low number of backorders could be attributed to the two month safety level given to provisioning/new items. The review team believes that a backorder improvement in this area should come through improved forecasting.

7. Stock/Nonstock Criteria. The criteria used to classify an item stocked or nonstocked does not impact on the number of backorders on stocked items except when a nonstocked item is initially classified stocked. At that point, materiel is not normally on hand and all requisitions are placed on backorder versus direct delivery until a materiel due in is received. DLA-O has initiated action to delay notification of stockage classifications until stock is on hand. Although the criteria does not impact backorders on stocked items, it does impact on overall ICP requisition responsiveness. That is, once an item is classified nonstocked, requisitions against that item are filled in a longer time period since they are procurement actions not depot issues. An important secondary impact is that increased requisitions for nonstocked items [illegible] procurement workload which could in turn delay receipt of materiel for stocked items. DLA-O is currently developing new DLA stock/nonstock criteria which will include these considerations.

F. Depot Operations.

1. Current Program. DCSC developed a program of identifying backordered items when they come off the trucks for expedite handling. DCSC is using a computerized cross listing of backordered and due-in materiel and comparing it manually to receipts. Materiel on the backorder list is consequently stamped with a red "expedite" and put aside for fast handling and accelerated storage, a savings of several days. To further improve this program, DCSC is currently testing a procedures automating this manual process of checking computerized cross listing with receipts. The new [illegible] extracting backordered data and placing it into the [illegible] receipt line which automatically identifies backordered receipts on the [illegible] receipts in turn get specialized fast handling. If this [illegible] successful, it will be continued by DCSC and might also be started by the remaining depots.

2. Potential Programs. This specialized fast handling method could also be applied to "potential" backorder items. These items would be stamped a second color to obtain special handling.

3. [illegible] Procedures. The Directorate of Contract Management [illegible] procedures [illegible] The objective of this effort is [illegible] Navy/DCSC program, but to create Defense Contract Administration [illegible] Air Force Air Logistics Centers (ALC). Under the terms of the procedures, a backordered item is an [illegible] initially limited [illegible] and AFLC

want to determine the workload generated by those procedures for both DCAS and the ALCs before expanding the program. The DCAS assistance would consist of an on-site visit by a DCAS representative prior to the CDD. He would determine the probability of an on-time or, if possible, an early delivery for backordered items. A one-time status report would be sent to the appropriate ALC. Special attention would then be given to these contracts until they were shipped. Delays in delivery would be promptly reported to the ALC concerned. Procedures similar to these are currently in affect between DCASR Los Angeles and Sacramento ALC. The results of this DCAS initiative need to be monitored closely since the procedures could potentially be applied to DLA and the other Services.

H. Backorder Management. The procedures for reporting and managing items on backorder, or potentially on backorder, impact on the time on backorder as well as the number of backorders. Intensified management, e.g., expedited deliveries for backordered items, reduces the time on backorder and avoids future backorders. Backorder reports should serve to put backordered items in priority sequence and allows IMs to know which items to center their attention on. The review team examined ICP backorder reports and procedures to see if a need exists for standardization or expansion. Finally the team reviewed how backorder goals are set for the ICPs.

1. Backorder Reports. In response to its request for information on backorder reports, the review team was provided the following:

a. Headquarters.

(1) RCS-26, "Management Data Report." This report lists materiel obligations established, stocked items, and outstanding stocked items.

(2) RCS-96, "Supply Availability and Workload Analysis Report." This report lists by Service and then by priority group the following:

(a) materiel obligations established (stocked items by Service only),

(b) materiel obligations outstanding by age category,

(c) backorders against stock replenishment outstanding by age category,

(d) DVDs outstanding by age category,

(e) requisition lines delayed,

(f) backorders against stock replenishment,

(g) DVDs established,

(h) stock numbers with materiel obligations established (by Service only)

(i) stock numbers in zero balance with materiel obligations outstanding (by Service only), and

(k) materiel obligation cancellations effected.

(3) "Selected Data Management Report (SMDR)." This report lists the following:

(a) materiel obligations on hand economic order point (EOQ) (stocked items),

(b) average number of days to release materiel obligations, and

(c) stock availability.

b. SAMMS.

(1) F-67, "Supply Availability and Workload Analysis,"

(2) F-38, "Backorder Age Summary,"

(3) F-220, "FSC Sequenced Supply Effectiveness Report," and

(4) F-31, "Listing of Items Placed on Backorders."

c. DGSC. DGSC has the following backorder reports which are described in Appendix B, Section 4.m.:

(1) "Backorder Position Report,"

(2) "Backorder Position Report - Top 200 NSNs,"

(3) "Top 200 NSNs with the Most Backorders Established,"

(4) "Top 800 Oldest Backorders,"

(5) "Customer Demand Analysis Data,"

(6) "NSNs with Nonissuable Condition Codes and Backorders," and

(7) "Intransits vs. Backorders."

d. DISC. DISC has the following backorder reports which are described in Appendix C, Section 4.m.:

(1) "Backorder Analysis Management Summary,"

(2) "Supply Management Category Codes (SMCC) Report,"

(3) "CSCH-41 - Backorder Information as Related to High Frequency Items,"

(4) "High Value Backorder Listing," and

(5) "Oldest Backorder Listing (pending)."

e. DPSC-T. DPSC-T has the following backorder reports which are described in Appendix D, Section 4.m.:

(1) "Daily Report of Materiel Obligation Variance,"

(2) "Consolidated Weekly Obligations Listing," and

(3) "Monthly List of Materiel Obligations over 90 and 180 Days Old."

f. DESC. DESC has the following backorder reports which are described in Appendix E, Section 4.m.:

(1) "Management Data Book,"

(2) "Monthly Management Information Review," and

(3) "Daily Operations Report."

g. DCSC. DCSC has the following backorder reports which are described in Appendix F, Section 4.m.:

(1) "CDKL 0150 Backorder Stock Type NSN" and

(2) "CRCH-41 - Backorder Information as Related to High Frequency Items."

2. Backorder Programs. In response to its request for information on backorder programs, the review team was provided the following:

a. DISC has the following backorder programs which are described in Appendix C, Section 4.m.:

(1) Inventory Managers Brief,

(2) SMART Team Management,

(3) Flow Management Review,

(4) Special Materiel Obligation Validation,

(5) Customer Advocate Program (pending), and

(6) Open Awards to Customers (pending).

b. DPSC-A has the following backorder programs which are described in Appendix D, Section 4.b.:

(1) Review of Every Item with 40 Lines or More on Backorder,

(2) Review of Every Item Receiving a First Time on Backorder Notification,

(3) Backorder and Critical Item Review Program, and

(4) Monthly Letter to Customers.

c. DGSC has the following backorder programs which are described in Appendix F, Section 4.m.:

(1) Commander's "10" Most Wanted Program,

(2) Critical Item Review Program, and

(3) F-019 Program.

3. Management of Backorders. Based on the above reports and programs, the ICP management of backorders appears to be good. ICPs are actively working backorders and have adopted programs to reduce backorders, programs which are tailored to the ICPs' management styles. Some parts of those programs are gimmicks; e.g., DGSC's "'10' Most Wanted List" and DGSC's "Beat the Backorders Button," but they are catchy and effective ways to highlight backorder reduction as the major work objective. The only improvements the review team could recommend are that the ICPs continue to improve communication and coordination between their directorates (see Section III.I.3.) and that the current management information system for backorders include causes. The latter recommendation may not be feasible due to the volume of backorders and the complexity in determining their causes. If it is infeasible, the ICPs could sample backorders periodically to determine causes; i.e., a backorder analysis program like those at DISC and DPSC-A.

4. Goals. Backorder goals for ICPs are set at HQ DLA by the Supply Operations Directorate. The procedure is to start with the funded goal (90 percent supply availability last year) and to add points for management improvement (3 percent last year) to arrive at the ICP goal (93 percent last year). The ICP goal is an overall goal and is not broken down by weapons systems items versus non-weapons systems items although DISC has elected to allocate its goals to achieve different levels of support for different groups of items. The review team believes the following improvements can be made:

a. Different backorder goals should be set for different groups of items as a way to improve support for weapons systems items. This may increase the overall number of backorders but it would direct the Agency more towards the support of military readiness, its primary mission.

b. Backorder goals for ICPs should be set by the Director, DLA, in order to emphasize that backorder management crosses directorate boundaries.

c. The addition of points for management improvement should be tempered. Uncontrolled occurrences, e.g., extended leadtimes, can hamper an ICP's ability to meet a funded goal and absorb any advantages of management improvements. If goals are continually set too high and never achieved, ICPs

will naturally direct their energies towards explaining why goals are not met and not towards meeting the goals. A funded goal should only be adjusted upward when a reasonable expectation of improvement exists.

f. Item Management. IMs can and do play a key role in working backorders. They can initiate actions to expedite materiel delivery, offer substitutes, initiate direct deliveries, adjust forecasts or levels to include information not in the computer, etc. DLA relies heavily on intensified management to reduce backorders as well as to ensure a high level of support for weapons systems. This is reflected in DLA's system of item management where SAMMS works from a single set of rules for forecasting demand and computing requirements levels and IMs are given great latitude to make adjustments. In looking at ways to reduce backorders, the review team considered different approaches to item management.

1. Single-Rule vs. Multiple-Rule Automated Materiel Management System. For purposes of this discussion, a single-rule automated materiel management system is an automated materiel management system which uses a single set of rules for its stockage policy. Parameters in individual rule may differ among items but the basic rules are the same. Multiple-rule automated materiel management system is an automated materiel management system which uses different sets of stockage policy rules for different groups of items.

a. Single-Rule Automated Materiel Management System. A conclusion which can be drawn from earlier discussions of demand forecasting and requirements levels computations is that in the current SAMMS is, for the most part, a single-rule system. The advantages of a single-rule system are ease of understanding and administration and the ability to easily institute policy changes through changes to a single-rule. The disadvantages are inability to consider special cases (e.g., manufacturing cycles in the computation of procurement cycles for some items), the uncertain accuracy of applying a single-rule to all items, the lack of flexibility of applying a single-rule to all items, and the lack of flexibility to provide in the automated system higher levels of support for different groups of items (e.g., weapons systems items).

b. Multiple-Rule Automated Materiel Management System. The different ICP SMCC systems are examples of multiple-rule systems, particularly the DESC system which adjusts requirements levels according to an item's SMCC. The advantages of a multiple-rule system are the ability to consider special cases, probable greater accuracy in applying resources, and the flexibility to provide in the automated system higher and lower levels of support for different groups of items. The disadvantages are difficulty of understanding and administration of a number of rules, increased difficulty to institute policy changes, and potential confusion as the number of item groups and rules could become so great that there is a lack of control.

c. DLA's Future Automated Materiel Management System. Since all of the ICPs have adopted SMCC systems and are starting to use SAMMS programs to adjust SAMMS decision, the single-rule system may be better replaced by a multiple-rule system. In discussing ways to improve backorders, the review team also advocated a multiple-rule system as the best way to apply resources (e.g., stock fund dollars, manpower and computer). If DLA's future automated materiel management system is to be a multiple-rule system,

then it is important to start to standardize the procedures for determining item groups and the rules which would be applied to individual groups. As is the case today, ICPs would be able to set the values for parameters of these procedures and rules on the basis of the commodities they manage; but the procedures and rules themselves should be standard across ICPs. In order to accomplish the above, the review team believes the first step should be the initiation of a study to redesign the SAMMS forecasting and requirements system.

2. Integrated Item Management. All of the ICPs have recognized the importance of the collective efforts of technical, contracting, and supply specialists in working backorders as illustrated by DISC's SMART team (see Appendix C, Section 2.b.). DCSC has extended the doctrine of integrated management to its organization where technical, contracting, and supply specialists are physically located together to work items. The review team believes that integrated management can affect backorders and DLA should continue to coordinate the efforts of the different ICP specialists with the common objective of improved customer support. Two new approaches to improving coordination are the DESC effort to integrate its directorates' objectives and the DCSC effort to integrate its directorates' goals.

3. Static versus Dynamic Item Management. With the exception of the [illegible] computation, DLA stockage policy rules are static in nature; i.e., they assume stability of demand and unit price. However, this is not the case as studies conducted by DESC show a large migration of its items between demand categories. For this reason, the review team believes that stockage policy rules should consider the dynamic nature of DLA items. Such a consideration should help to improve the application of resources and reduce backorders.

4. Tools for IMs. Since IMs are given great latitude in changing [illegible] it may be helpful to provide the managers with tools to help make changes. The tools would be analytical and would be designed to give the IM the probable impacts of different changes. For example, if an IM wishes to change a quarterly forecast for an item, he could enter the change into a calculator or remote terminal programmed to give him the new requirements [illegible] procurement actions, investment changes, and potential [illegible] impact. The review team believes this type of tool could help reduce backorders by permitting IMs to check the impacts of their decisions before the fact.

E. CONCLUSIONS AND RECOMMENDATIONS

A. General. In seeking the causes of backorders and ways to reduce backorders, the review team found that backorders were being actively worked and efforts to reduce backorders were ongoing at all levels. However, the [illegible] of backorders cannot be worked at all levels and require [illegible] The review team prepared recommendations which [illegible] and which offer innovations in system redesign. [illegible] and subject to change when revised by the [illegible] It is the opinion of the review team that implementation of the recommendations will significantly improve DLA's backorder position.

B. Conclusions and Recommendations.

1. [illegible] Demand forecasting in DLA needs to be improved. The

statistics which the review team were able to collect and the ICP responses which list forecasting as the primary cause of backorders demonstrate the need for improvement. Moreover, an improvement in forecasting should not only reduce the number of backorders but should also prove economical in reducing long supply assets and safety level stocks.

Recommendations:

DLA-LO expand its current forecasting study to include recommendations put forth in this review. When DLA-LO initiated its study, it centered its plan on the need for incorporating seasonality in SAMMS forecasting. Although the plan does include some of the recommendations in the review, it is being expanded to include all of the recommendations.

DLA develop a customer research capability to predict long term demand trends, new product demands, mission changes, and obsolescence of old products. The DLA-LO study will satisfy the immediate need of a study to improve demand forecasting in DLA. However, improved forecasting should not be approached as a one-shot effort. The elements which contribute to our customers' demands are not static and we need to continue our efforts to forecast better by studying those elements on a continuous basis.

2. Conclusion: Increasing ALTs have deteriorated DLA's backorder position. The statistics which the review team collected on ALTs show an upward trend. At the same time the ICPs list extended leadtimes as a primary cause of backorders.

Recommendation: The Director of Contracting should review the recommendations for reducing ALTs in Section III.C.1.a.(3) and determine if the upward trend can be stopped or reversed.

3. Conclusion: The PLTs of record do not reflect actual PLTs. As in the case of ALTs, the PLT data shows an upward trend which the forecasts of PLT lags due to their computation. This gap in turn causes backorders.

Recommendation: DLA strengthen its market research capability and develop procedures to integrate market conditions into its forecasts of PLTs and other item management policies in Supply Operations, Contracting, and Technical Operations. Although the review team found market research analysts predicting future changes in leadtimes and unit prices due to market conditions, no mechanism exists to translate that information into the requirements levels computations. Moreover, the ICP market research capability consists of one individual who publishes newsletters on market information extracted from periodicals. Perhaps, a central staff should be created to (1) contract for market information or market research models for critical DLA managed items, (2) develop procedures for incorporating market information into item management decisions, and (3) monitor the overall market availability of strategic metals and products.

4. Conclusion: Contractor delinquent deliveries are not considered in the computation of requirements levels, particularly safety levels. Since a large number of procurements are late, the probability of late receipt should be part of the computation of the safety level. This should strengthen the performance of the safety level.

Recommendation: The Director of Contracting continue to review ways to reduce delinquencies and DLA-LO consider how delinquencies can be included in requirements levels computations.

5. Conclusion: The ICPs' use of SMCCs demonstrates the need to redesign SAMMS' requirements levels computations in order to have different sets of rules for different categories of items instead of a single set of rules for all items.

Recommendation: Supply Operations and DLA-LO develop an improved requirements system that incorporates multiple-rule materiel management. The new system should provide improved weapons systems support by directing ICP efforts to weapons systems categories of items. The improved accuracy of a multiple-rule system may limit or eliminate any drop in overall inventory performance which could occur from reallocating resources to weapons systems items.

6. Conclusion: Although investment levels are set in the stock fund budget process, the procedures for executing the budget differ among the ICPs and how the procedures impact on performance is unknown.

Recommendation: The Comptroller continue to develop an ICP requirement for budget execution plans and those plans demonstrate probable impacts of ICP procedure for executing their budgets. This is not to say that ICPs are not making the best decisions now with regard to budget execution. However, whenever different approaches are used, as is the case of budget execution among the ICPs, there is a potential for a best approach. The development of plans which include impacts of alternatives should help the ICPs realize that potential.

Recommendation: Analytical models should be developed to aid the ICPs in measuring impacts of alternative budget execution schemes. In some cases, the current SAMMS simulation model could be used while, in other cases, a single purpose model or inventory analyzer could be used. Models which simulate the impacts of manpower changes or which evaluate trade-offs between stock funds and [illegible] funds also would be helpful.

7. Conclusion: Depot operations and the interface between ICPs and [illegible] backorders.

Recommendation: DLA consider ways to release backorders faster from its depots, reduce inventory losses, and also consider expanding depot procedures for releasing backorders to include potential backorders.

Conclusion: Contract administrators can be used to help identify potential [illegible] vendors; and in the case where backorders exist, they can be used to [illegible] the need for prompt delivery of materiel.

Recommendation: The Contract Management Directorate should [illegible] the [illegible] initiative with the Air Force to determine [illegible] or [illegible] could be applied to DLA and the other Services.

9. Conclusion: Management information systems for backorder data are concerned only with counts not causes.

Recommendation: Current management information systems for backorders should be expanded to include information on causes of backorders. Due to volume of backorders and the complexity in determining their causes, collecting this information in SAMMS may not be feasible. If it is infeasible, the ICPs could sample backorders periodically to maintain emphasis on the correct problem areas.

10. Conclusion: The backorder goal for an ICP is set by adjusting the funded goal with an expected management improvement factor.

Recommendation: DLA should set different backorder goals for different categories of items, such as weapons systems items, and should adjust funded goals only when there is a reasonable expectation of management improvement.

APPENDIX A

DLA-LOO 13 August 1981

MEMORANDUM FOR RECORD

SUBJECT: Discussion of Backorders with DLA-O

1. On 13 August 1981, Mr. Zimmerman, Capt. Frazier, and Mrs. Swim of DLA-LO met with Mr. Kohler, Mr. Johnson, and Mr. Ward of DLA-OS in order to discuss the causes of backorders.

2. The DLA-O personnel attributed backorders to two primary causes, demand variability and contract delinquencies. They expressed several opinions concerning these two causes. One was that demand variability is something DLA has no control over since it cannot know exactly what the Services will demand. Another opinion was that, as DLA-O personnel understand the problem, contract delinquencies can be controlled to some extent by the Centers. The number of contract delinquencies is in reports produced for contracting personnel. A third thought was that a management tool could be developed that would indicate how many items in a backorder position also have delinquent contracts. This tool would be valuable both to Supply Operations and Contracting personnel. A fourth idea was that PLTs are wrong as soon as they are input to the system. In order to get a contract, a firm will say it can meet a RDD, even if it knows it cannot meet that date. Because the RDD is what the PLTs are based on, this incorrect data automatically produces an incorrect PLT as soon as the award is made; however, only the contractor knows that he cannot produce by that date. A fifth observation was that over the last several years both ALT and PLT have been steadily increasing. Both ALT and PLT are recorded in the SAMMS files and in the stratification. A sixth idea was that a solution to the problem would not be to just buy more stock. A seventh thought was that when DLA capitalizes items, these items are often in a backorder position or in possession of a dry pipeline. A final observation was that DESC had stated that zero safety levels on some weapons systems items had caused numerous backorders.

3. Supply operations causes some of its own problems. DLA-OSK has sent out a letter emphasizing that leadtimes need to be updated in a timely manner. ALT is totally under the control of DLA, but no money is made available to work on reducing it. PMMIPS control levels definitely cause some backorders by releasing certain amounts of stock for only IPG I and IPG II requisitions. Some Centers have held back requisitions in order to hold down backorders. DLA-O has stressed this procedure by emphasizing that, according to regulation, the highest priority requisition must be filled first. By preventing the Centers from using this procedure, DLA-O will cause a slight increase in backorders. The primary problem is that the demand forecasting method used by DLA [illegible] the SAMMS system of requirements forecasting definitely needs improvement.

4. Mr. Ward in DLA-OSM monitors the backorder problem by using the RCS-96 Report. During January through March 1981, he studied the causes for items placed on backorder for the first time. Using data from each of the hardware Centers for this three-month period, he determined that 73.6 percent of these backorders were caused by unforecasted demand.

5. DLA-O has no report that relates provisioning to backorders. The provisioning requirement is set by DLAM 4140.3.

6. No separate report exists that shows the dollar value of investment in safety levels and procurement cycles. These figures are available in budget and stratification reports.

7. The stock fund budget goal is set by OSD at the level of 90 percent stock availability. Within DLA-O, historical trends, management goals, and judgment are used to set backorder goals. The system goal is 300,000 backorders on hand. This figure is a total of the goals set for each of the Centers. Mr. Ward maintains these figures. Some management goals conflict with established facts. Even though DLA is funded for only 90 percent stock availability, the goals are set at 93 percent for the hardware Centers plus Clothing and Textiles and 95 percent for the Medical Commodity. Management initiatives are supposed to enable the Centers to reach the goals, even though funds are not available to reach those goals.

William R Frazier, Jr.

WILLIAM R. FRAZIER, JR, CAPT, USAF
Operations Research Officer
Operations Research Branch

DLA-LOO 19 August 1981

MEMORANDUM FOR RECORD

SUBJECT: Discussion of Backorders with DLA-P

1. On 19 August 1981, Mrs. Swim and Capt. Frazier of DLA-LO met with Mr. Philip Church of DLA-PRS in order to discuss the causes of backorders from the procurement perspective. Mr. Church provided the DLA-LO representatives with a large amount of information covering the entire field of procurement. He supplied the DLA-LO members with a draft copy of a study he completed in April 1981 concerning the causes of contract delinquencies.

2. Mr. Church feels delinquencies are probably one major reason for backorders along with demand variability, PLTs, and ALTs. However, past analyses show no significant correlation between delinquency rates and supply availability. Current delinquency statistics apply to both stocked and nonstocked items; a SAMMS change is being considered which will break out delinquencies by stocked and nonstocked items. This will enable DLA-P to better analyze the relationship between delinquencies and backorders.

3. The F-36 Report is a procurement data management report that the Centers get monthly through the SAMMS process. The F-38, "Contract Delinquency Report," (run weekly) lists all delinquent contract line item numbers (CLINS) by contracts for each administrative location. The revised F-42, "Contractor Performance Report," lists the total delinquent CLINS by month for the past year attributable to a specific contractor. The RCS-26 Report draws its information from the F-36 Report. Overall contract delinquency rates are calculated each month at all SAMMS centers on the F-36 Report.

4. Under the generic term "contract" exist several different types of contracting documents. A contract, per se, normally has a face value of $10,000 or more and is a bilateral agreement. Purchase orders are typically valued less than $10,000, utilize small purchase procedures, and are unilateral. An indefinite delivery type contract (IDTC) is a document that usually commits the Government to buy a maximum or minimum quantity during a specified period upon issuance of delivery orders. The contractor is legally bound to provide that minimum or maximum quantity. Delivery orders are issued against the IDTC by procurement. Neither a blanket purchasing agreement (BPA) nor a blanket ordering agreement (BOA) is a contract. It is a framework against which the Government can place "calls," usually on a DD Form 1155, "Order for Supplies or Services," also used for other small purchases. The Government does not have to buy; the contractor does not have to provide. These documents state only that if the Government wishes to buy that the contractor will try to provide and set up a framework for determining price (e.g., a certain catalog price). DVDs apply primarily to nonstocked items. Approximately 40 percent of the DLA buys are for DVDs. The number of DVDs has definitely increased with the inception of the Commercial Support Program (CSP) projects. Two of the effects of CSP are that the procurement workload has increased and procurement has a tougher job trying to get a good price and preferred customer status since buys are often for small quantities.

5. For small purchases (buys under $10,000), procurement personnel have created an automated system in two parts. Under SAMMS Automated Small Purchase System (SASPS), Phase I, which is for purchases less than $500 (or less at some DSCs) the computer using a file of contractors makes noncompetitive awards to contractors in sequence of listing. Under Phase II, which is usually for purchases from $500 up to $10,000, the computer using a file of contractors initially screens for SASPS I eligibility then solicits quotes from contactors identified as suppliers of the item. Once the quotes are received, they are input to the computer which makes the award to the lowest bidder, price, and delivery considered. Delinquency statistics indicate that 100 contractors at each hardware Center account for about 41 percent to 55 percent of total delinquent lines. However, although some of these contractors have many delinquencies, they often do a lot of Government business and may deliver the majority of their CLINS on time.

6. Award documents are sometimes delayed in distribution and some contractors have reported nonreceipt of award documents. One Center is attempting to remedy this situation by sending contractors a list of the awards he should have received within the last 30 days.

7. A way to eliminate some delinquencies would be to clear out dreg end balances. A dreg end balance is the small residual quantity on an order that in all probability will never be offered for delivery because a dealer is out of stock or a manufacturer has too few orders for an economic production run. This action would only be taken with the consent of Supply Operations personnel. The action would consist of notification to the firm that it must ship the rest of the order within some prescribed time or the order will be closed out and the money deobligated.

8. Most DLA contracts are either fixed price or fixed price with an escalation clause. Eighty-two percent of contracts (over $10,000) are administered by DCAS. About 88 percent of the small purchases (awards under $10,000) are administered by the Center concerned. (These figures only apply to hardware Centers and DPSC-Medical.)

9. The CLINS are not printed on the F-38, "Contract Delinquency Report," until 30 days after the CDD. This is so because many delinquencies clear up within 30 days of the CDD: indeed, due to paperwork flow time it often takes 30 days or more for the mechanized system to acknowledge shipment or receipt of an item. Due to heavy procurement workloads, items which are 1-30 days late usually aren't actively pursued unless Contracting is advised by Supply Operations (or the customer) that there is an urgent need. (Note: This is not the case for DX or High priority items.)

10. DLA has some problems with sole/single source manufacturers. A sole source refers to the fact that only one firm makes the item. A single source refers to the fact that only one firm will do business with the Government. Source problems could exist with either small or large purchases. About 43 percent of the 200 items to be study written on Mr. Gantt were sole source. Two factors involved in the sole/single source problem are the shrinking industrial base and the fact that the Government is not always a preferred customer. More government resources need to be devoted to market research. DLA has little leverage to command timely deliveries in such cases.

11. Some other problems are that DLA must set aside certain contracts for small businesses which often are not experienced in government contracting; and also DLA does not always buy in full EOQs. The small business requirements have merit but they sometimes present obstacles to efficient procurement of items. Under the fast pay program for small purchases, payment is sent to the firm as soon as the Office of Accounting and Finance processes the invoice stating the order was shipped. If the order is not received or is defective, the Government has 90 days to require the contractor to replace, repair, or correct the problem. The DSCs have estimated that possibly one third of the items bought are delivered early. In the past, these items were not counted by SAMMS and delinquency rates were overstated. A recent change (June 1981) corrected this and the effect of early deliveries should be evident by the end of the year.

12. Mr. Church had some other comments. He stated that about 89 percent of the awards by DLA were in the form of small purchases but these only account for about 35 percent of the dollars obligated by DLA. Purchase orders range from $1 up to $10,000. The upper limit of SASPS I buys depends on the Center being discussed. Most of these documents are unilateral agreements of which about 3% percent are manually processed. A firm does not actually accept a purchase order until it takes action to fill that order. During FY 1980, DLA made 1.2 million awards for 3.5 million CLINS.

13. Mr. Church pointed out that some remedies have significant drawbacks. For example, bilateral contracts could be used on more small purchases so that the threat of termination for default (T/D) would exist. However, T/D is an extremely time consuming and labor intensive process which is often not worthwhile for small dollar purchases. (Note: The unit price of 78 percent of DLA items is less than $25.) For similar reasons trying to assess penalties for late deliveries could be counterproductive; the time and effort expended in doing so would often exceed the value of the award. However, it may be useful to emphasize to Centers the importance of awarding only to responsible, prospective contractors and to rely more heavily on past delivery performance when doing so. Taking business away from poor performers is one of our strongest financial incentives for encouraging on-time deliveries. Also, [illegible] DLA-P efforts to reduce repetitive buys would be very useful since fewer buys for larger dollar amounts give the Government increased leverage and also reduce administrative requirements.

14. PALT is the segment of leadtime under the control of procurement activities. Longer PALT means fewer awards and that means more Purchase Request (PR) aging. Both PALT and PR aging refer to the time period between receipt of the PR in contracting and award of the PR to a contractor. Under Phase I, PALT is easy; but if any problem arises, the PR must be processed manually. The objective of Phase I and Phase II is to lower the PALT for small purchases.

15. [illegible] procurement divisions are not staffed to process the large number of awards that they must handle, they engage on an exception basis. Delivery on small purchases is usually not pursued until at least 30 days after the [illegible] are placed on high priority, backordered, and 90+ day delinquent CLINS. When a contractor has an excusable reason for delay (beyond [illegible] can be extended and delinquency avoided. This rarely happens and, in any event, doesn't reduce backorders.

16. On automated buys, DLA should eliminate the RDD (which is arbitrary on DVDs) and substitute the best estimate of the contractor concerning a realistic delivery date. As the system works now, if a firm wants an award it may agree to an unrealistic RDD, knowing it usually is not penalized if delivery cannot be made by that date. As proposed now, this change would only apply to DVDs since RDDs for stocked items are based on historical data and are fairly realistic.

17. On small purchases DLA could request more pre-award surveys. These surveys would not have to be the same expensive surveys used for large purchases, but could simply be a desk audit by qualified DCAS personnel. This survey would penalize those contractors who were continually delinquent. If the pre-award survey results are negative, then the case would be referred to the Small Business Administration (SBA) if a small business is involved. Continually delinquent contractors would have to obtain a Certificate of Competency (CoC) from the SBA before they could receive awards. During FY 1980, only 101 CoCs were given out to firms that had negative pre-award surveys. There were 344 cases referred to SBA.

18. Mr. Church had two other comments. One was that military specifications produced problems e.g., [illegible] oil is required in all metal cans. Possibly if some of these specifications could be relaxed, more sources for these items could be found. Another comment was that if the threshold on small purchases is raised to $25,000 by Congress, the ALT will probably decrease. More small purchases will mean more automation, less documentation, and more use of small purchase procedures which considerably reduce the time required to make a buy.

William R. Frazier, Jr.

WILLIAM R. FRAZIER, JR, CAPT, USAF
Operations Research Officer
Operations Research Branch

DLA-LOO 16 September 1981

MEMORANDUM FOR RECORD

SUBJECT: Discussion of Backorders with DLA-A

1. On 16 September 1981, Capt. Frazier (DLA-LO) met with Mr. Sickmeyer (DLA-AP) in order to discuss the initiative DLA-A has in order to give relief to the Air Force in resolving some backorder problems.

2. In coordination with HQ AFLC DLA-A has developed a set of proposed procedures for backorder item identification that would apply to the Sacramento, Ogden, San Antonio, Oklahoma City, and Warner Robins ALCs and DCAS. Under the terms of these procedures an item on backorder is defined as an item (1) on contract but not due for delivery and (2) assigned a priority designator 01 through 06. The priority limitation was established so that the procedures could be tested and the workload impact could be determined. By identifying the items prior to the CDD, DCAS would be able to find out through an on-site visit whether or not the contractor expected to meet his CDD. If a problem had arisen DCAS, would attempt to resolve the problem. The DCAS representative would try to ascertain the probability of on-time or, if contractually authorized, early delivery. This determination would be sent to the appropriate ALC in a one-time status report. DCAS would perform intensive follow-ups until the contract was shipped. Any delivery delay would be promptly reported. This proposal is being coordinated at HQ AFLC.

3. Currently, DCASR Los Angeles and the Sacramento ALC have an arrangement under which the status of all contracts with items on backorder is investigated no earlier than 60 days before the RDD by the Contract Administration Office (CAO) and that status is reported to Sacramento. This procedure is functional but it needs to be fully coordinated at the Headquarters level and broadened to cover all the ALCs. A significant problem that Sacramento has is that many of its items on backorder are from sole sources. The program objective is not to terminate any contract, but to let the contractor know that, if possible, the items with backorders should receive special attention.

4. Mr. Sickmeyer cited some problems that DCAS has. One is that the DCAS representative has only a limited knowledge of the order board for a contractor. Contractors do not want any person outside of the company to know exactly how much business they really have, especially since they usually have a backlog. Another problem is that because of the profit motive, contractors desire to make only economic production runs. They let small orders stack up until it is profitable to produce. Many of the orders from DLA are small. A third problem is that many of the purchases by DLA are not for an economic order quantity. A fourth one is that DCAS does not always have the same information about a contractor that procurement personnel at the centers have. This lack of communication can sometimes result in CAO personnel not knowing some valuable information about a contractor.

5. Mr. Sickmeyer stated that in cases when reasonable doubt exists concerning the responsibility of a contractor, that DCAS does perform pre-award surveys on

small purchases. These surveys are expensive, but since most of the DLA procurements are small purchases, the surveys would be valuable in select cases.

William R Frazier, Jr.

WILLIAM R. FRAZIER, JR, CAPT, USAF
Operations Research Officer
Operations Research Branch

APPENDIX B

DLA-LOO 21 August 1981

MEMORANDUM FOR RECORD

SUBJECT: HQ DLA Backorder Review Team Visit to DGSC

1. Background: On 21 August 1981, the HQ DLA Backorder Review Team paid a one-day visit to DGSC to discuss ways to reduce backorders.

2. Purpose: The purpose was three fold:

a. To obtain analyses/studies conducted by DGSC in the past and which are still relevant to the topics of:

(1) backorders,

(2) forecasting,

(3) requirements computations,

(4) leadtimes, and

(5) delinquent deliveries.

b. To obtain answers to 13 backorder-related questions raised by the HQ DLA Backorder Review Team.

c. To acquire copies of the following reports:

(1) "SAMMS F-0C2 Report,"

(2) backorder reports,

(3) delivery reports, and

(4) leadtime reports.

3. Participation:

a. HQ DLA Backorder Review Team. The following members of the Review Team participated in the visit:

Mr. George T. Clark, Jr., DLA-LO (Autovon (AV) 284-6715
Mr. Gerald L. Zimmerman, DLA-LOC, (AV) 285-7227, Team Leader
Capt. William Frazier, Jr., USAF, DLA-LOC, AV 285-7227
Mrs. Theresa Cole, DLA-LOC, AV 284-6152

b. DGSC Staff Members. The following DGSC personnel participated in the discussion of backorders at DGSC:

Ms. Sally Hundley	DGSC-AS	AV 695-3938
LT Wayne Strouse	DGSC-LX	AV 695-3564
Mr. Frank Lotts	DGSC-OM	AV 695-4122
Mr. Jim Stansbury	DGSC-OMPA	AV 695-3046
Mr. Dick Heuerman	DGSC-PE	AV 695-3961
Ms. Pat Lane	DGSC-SPA	AV 695-4298

c. Exit Interview. Before leaving DGSC, the Review Team met CAPT R. E. Plante, SC, USN, at DGSC.

4. Findings: The following questions were discussed by the Review Team and the DGSC staff members:

a. WHAT ARE THE CAUSES OF YOUR BACKORDERS?

According to Supply Operations, the three primary causes are contractor delinquency, extended ALT, and increased demand. According to Contracting and Production, the three primary causes are unrealistic PLTs, too many small requisitions to procurement, and delinquent contracts.

b. HOW COULD YOU REDUCE BACKORDERS?

Supply Operations is approaching the area of backorder reduction from several areas and consideration is given to the team effort of the Directorates of Supply Operations, Contracting and Production, Technical Operations, and Storage and Transportation that is required. Our actions are directed in the following areas:

Assuring we are buying enough - soon enough
Assuring the award is on time
Assuring the delivery is on time
Assuring the product is of issuable quality
Assuring the assets are not lost in storage

c. WHAT ARE THE CAUSES OF DELINQUENT DELIVERIES?

DGSC feels that procurement cycles for selected items are too low. DGSC produces a listing of items with ALTs which equal or exceed the procurement cycle. This listing is to avoid the problems/delays/extensions in the procurement process which can be created by having two or more unawarded PRs in the buying element at the same time. DGSC has to deal with nearly the entire spectrum of civilian industry in competition with civilian companies.

d. HOW DO YOU ATTACK THE PROBLEM OF DELINQUENT DELIVERIES?

DGSC attacks the problem of delinquent deliveries by taking these initiatives:

(1) Improved information to contractors - "Report Card on Contractor Performance."

(2) Account management including special efforts on habitually delinquent firms.

(3) Prompt action on delinquent contracts.

(4) Realistic PLTs.

(5) Pride team for sole source contractors.

(6) Fast pay withdrawal.

e. HOW BAD ARE YOUR FORECASTS?

With the exception of too frequent a forecast on low demand NSNs discussed in 4.f. below, improvement in the overall forecasting methodology can only yield marginal improvements when compared to improvement in other areas integral to forecasting; i.e., leadtime estimates.

f. DO YOU INTEND TO IMPROVE ON YOUR FORECASTS? IF SO, HOW?

DGSC has initiated Annual Forecasting on over 16,000 low demand NSNs. This initiative, effective 1 July 1981, is an attempt to improve forecast accuracy through an extended data base.

g. HOW COULD YOU REDUCE ALT?

DGSC could reduce ALT by having procurement personnel:

(1) Control Procurement Workload:

(a) minimize DVDs.

(b) roll up similar items (grouping PRs).

(c) buy less frequently.

(d) increase automation.

(e) IFBs.

(2) Prioritize Work:

(a) DISC Program.

(b) "Million Dollar Club."

(3) Override delayed procurements with spot buys.

h. "DO YOU USE PROCEDURES OUTSIDE OF SAMMS TO UPDATE LEADTIMES" DO YOU USE MARKET RESEARCH/PRODUCTION RESEARCH?

DGSC has two areas of interest regarding updating leadtimes:

(1) Our concern is that the ALT is updated at the point of award. Thus, when ITs experience significant delays beyond the current ALT estimate

the knowledge that the previous estimate is somewhat invalid is not utilized. Based upon this concern, we have previously updated the ALT on all NSNs which have aged PRs in excess of the current ALT on the item. DGSC has previously reviewed the significance of Production Leadtime Variance. This review was based on our concern over the dispersion of PLT occurences around an established mean estimate.

(2) DGSC market research is primarily focused on assessing changes in the industrial section with respect to the effect on PLTs for our NSNs. The result of this assessment is published quarterly.

i. DO YOU HAVE KNOWLEDGE OF PROGRAM DATA WHICH YOU COULD USE IN FORECASTING?

The only available program to help with the forecasting of requirements is the Customer Demand Analysis Data (CDAD) Program. Under this program DGSC produces a report on its top customers which it then uses to open lines of communications. Up to this point, the program has not been entirely successful as the "Top 100" customers have responded to DGSC's request for forecast information with historical data already on file. We hope to use this program to get advance information on demands and predict unprogrammed demand surges.

j. DO YOU ADJUST COMPUTED PROCUREMENT CYCLES AND SAFETY LEVELS? IF SO, HOW?

DGSC adjusts procurement cycles in two ways:

(1) On a one-time effort, DGSC increased cycles on some 700 NSNs to improve supply support.

(2) It is ongoing policy to insure truest procurement cycle periods are equal to or greater than ALTs in order to preclude multiple PRs in Contracting and Production at one time.

DGSC does not adjust safety levels.

k. DO YOU REALIGN YOUR INVESTMENT DOLLARS OUTSIDE SAMMS? IF SO, HOW?

DGSC does not realign investment dollars outside SAMMS.

l. HOW DO YOU HANDLE BUDGET RESTRICTIONS?

We have segmented the DGSC stock items into six major groups based on average requisition costs. During budget restrictions we constrain/reduce procurements in higher cost areas.

m. WHAT MANAGEMENT PROCEDURES/REPORTS DO YOU HAVE FOR ITEMS WITH BACKORDERS?

DGSC has the following management reports for items with backorders:

(1) "Backorder Position Report," lists and summarizes all backorders (BO) by NSN. Status of assets is also provided for each NSN with a backorder. The report is provided in both NSN sequence and (GRC) sequence on a weekly basis.

(3) "Backorder Position Report - Top 200 NSNs," lists the 200 NSNs having the most backorders in descending sequence. This report is in the same detailed format as the "Backorder Position Report." Produced weekly.

(4) "Top 200 NSNs with the Most Backorders Established," lists the 200 NSNs having the most backorders established during the report period. This report quickly identifies those NSNs having the most impact on the system S/A and backorder increases. (Programming not completed)

(4) "Top 800 Oldest Backorders," is extracted from the F31 Report. The report is put out monthly in age sequence and ORC sequence. (Programming not completed.)

(5) "Customer Demand Analysis Data," has been modified to provide a backorder count by DoDAAC (customer address) on a monthly basis.

(6) "NSNs with Nonissuable Condition Codes and Backorders," lists all NSNs with backorders and unissuable assets; i.e., condition code F, J, L, etc. This report is produced monthly for use of inventory managers.

(7) "Intransits vs. Backorders," lists all NSNs with a backorder and an intransit. Listing is in two parts; Part 1 is sequenced in dollar value of intransit sequence; Part 2 is sequenced in descending backorder line sequence. The report is used as a means to prioritize efforts to clear intransits toward those where there is the greatest payoff in terms of backorder releases.

On a weekly basis, information on the reason for backorder is obtained on the Top 30 NSNs with the most backorders established. This early information is used to increase the priority of actions to correct the backorder situation on the identified NSNs. The Top 10 oldest backorders are reviewed on a monthly basis to clear unnecessary backorders. Once each month, Supply Operations hosts a critical item review with the Commander and covers reasons/actions on 50 of the Top 200 NSNs with the most backorders on hand. Representatives for Contracting and Production and Technical Operations provide input also.

5. Follow-up. [illegible] personnel are sending us additional information regarding demand frequency and amount of backorders on new/provisioning items.

William R. Frazier Jr.

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Operations Research Officer
Operations Research Branch

APPENDIX C

DLA-LOO 24 August 1981

MEMORANDUM FOR RECORD

SUBJECT: HQ DLA Backorder Review Team Visit to DISC

1. Background: On 24 August 1981, the HQ DLA Backorder Review Team paid a one-day visit to DISC to discuss ways to reduce backorders.

2. Purpose: The purpose was threefold:

a. To obtain analyses/studies conducted by DISC in the past and which are still relevant to the topics of:

(1) backorders,

(2) forecasting,

(3) requirements computations,

(4) leadtimes, and

(5) delinquent deliveries.

b. To obtain answers to 13 backorder-related questions raised by the HQ DLA Backorder Review Team.

c. To acquire copies of the following reports:

(1) SAMMS F-062 Report,

(2) backorder reports,

(3) delivery reports, and

(4) leadtime reports.

3. Participation:

a. HQ DLA Backorder Review Team. The following members of the Review Team participated in the visit:

Mr. George S. Clark, Jr., DLA-LO, Autovon (AV) 284-6715
Capt. William Frazier, Jr., USAF, DLA-LOO, (AV) 284-7223

b. DISC Staff Members. The following DISC personnel participated in the discussion of backorders at DISC:

Joe Devine	DISC-CD	AV 442-3072
Bob Bridges	DISC-LC	442-3629
Gary Howe	DISC-LC	442-3630
Jeff Barnes	DISC-LC	442-3629
Arnold Moskowitz	DISC-LC	442-3630
Carol Smeltz	DISC-LSB	442-3636
Doug Smith	DISC-LSB	442-3469
Joe Ceccoli	DISC-OBA	442-3375
Jim Kauffman	DISC-OBP	442-3694
Thomas Burke	DISC-PI	442-2383

4. Findings: The following questions were discussed by the Review Team and the DISC staff members:

a. WHAT ARE THE CAUSES OF YOUR BACKORDERS?

BACKORDER STUDIES
Percentages for Primary Causes

Reason	May 80		Aug 80	Nov 80	Feb 81	May 81	Avg.
Increasing/Erratic Demands (Includes Inactive Items and NSO Items)	37		37	37	42	43	40
Delinquent Contracts (Includes Extended CDDs, Contractor Error on Bid and Contractor Claim Nonreceipt of Order)	21		23	24	24	20	22
Increasing ALT/PLT	12	ALT	8	4	4	6	5
		PLT	9	6	7	4	7
Control Levels	7		3	5	–	–	3
Procurement/Specification Problems (Includes Unable to Award, Unable to Meet Specification, Annual Buy Problem on Cherry Max Rivits, Incorrect PID)	5		5	5	3	7	5
Inventory Loss (Includes NCAD Erroneous Denials)	5		0	1	1	2	2
New Item	4		3	–	2	4	3

Management Policies (No Safety Level, Reduced SMCC, Disposal, CESP, FMS, ROPL, Opposite Coast)	4	7	6	9	6	6
Condition Code Materiel	3	3	3	3	2	3
Cataloging Problems	2	2	3	4	3	3
Capitalized Dry Pipeline	1	1	1	1	1	1
Other	—	—	—	—	—	—
	101*	100	100	100	100	100

*Total differs from 100 due to rounding

F. HOW COULD YOU REDUCE BACKORDERS?

Background: DISC has continually had a number of management projects and ongoing actions that are addressed to reducing backorders. Many of these projects fall within the major causes of backorders, demand patterns, contract delinquency, and increased leadtimes. We are also continually reviewing our system for potential new projects and reviews that will reduce backorders.

Discussion: Some of our current actions and initiatives include:

(1) Demand Patterns:

(a) Director of Supply Operations Briefs - For selected items with rapid demand increases, our inventory managers brief the items with the Director of Supply Operations after demand analyses and contact with users. This promotes improved demand forecasting and awareness.

(b) Customer Advocate Program - We are implementing a customer advocate program in our Emergency Supply Operations Center (ESOC) area to improve communication on demand trends with prime customers.

(c) Increased Procurement Cycle Period (PCPs) - PCPs allow for greater demand fluctuations and we have taken actions to lengthen PCPs to reduce stock buy frequency. Some of the actions include minimum PCP of four months on high value items and an increase of PCP by approximately 50 percent on medium demand value items.

(2) Delinquency:

(a) Contractor Visits - We have an active program whereby DISC management personnel visit contractors and aggressively follow up on contacts established.

(b) Contractor Reconciliation - A unique ADP is being established to forward, monthly, a complete list of open awards to contractors. This will establish a regular vendor reconciliation with contractors receiving the most orders and reduce instances of nonreceipt of contract copies.

(3) Increased Leadtimes - ALT and PLT:

(a) Prioritization of PRs - A local DISC computer system implemented to stratify and assign priorities to our open PR workload in terms of actual and anticipated backorders.

(b) Telex RFQ - Automated forwarding of requests for procurement quotes vial message reducing ALT.

(c) SMART Team Item Management - Transfer of selected items to a special ESOC team of inventory managers, procurement and technical specialists, sharply reducing ALT and PLT.

(d) Oldest Backorder - Unique AIS - Special reports identifying oldest backorders for special review by management and inventory manager levels to identify unusually extended leadtime situations.

(e) Banking of DVD PRs - DVD backorders are held for one week for combining PRs for the same item into a single PR.

(f) Mechanized Envelope Stuffer - A Pitney-Bowes Computer Output Mailing System (COMS) has been installed to expedite stuffing and mailing of 4,000 request for quotes (RFQs) per hour on SASPS II (solicitations valued under $10,000).

c. WHAT ARE THE CAUSES OF DELINQUENT DELIVERIES?

Background: A primary responsibility of the Post Awards Branch is to evaluate contractor performance, maintain surveillance of deliveries, and take necessary action to identify delinquent contracts and contractors' failures in meeting contract obligations. Follow-up actions are taken by the Contract Performance Section (PIBC) and contract administration actions are taken by the Contract Administration Sections (PIBA/PIBB), under the direction of the Post Awards Branch Chief, for the purpose of minimizing contract delinquencies.

Discussion: Delinquent contract causes may be separated into two major categories, contractor and government problems. Contractor and government problems contributing to delinquencies are as follows:

(1) Contractor problems:

(a) Production scheduling/ overloads are caused by either poor control systems or projecting delivery schedules at the time of quote with uncertainty of awards. Contractors quote on their present capacity and find that the capacity is no longer available at time of award or that the volume of awards exceeded expectations at the time of quote.

(b) Failures of distributors to hold manufacturers to scheduled deliveries and failures of manufacturers to obtain material required.

(c) Failure in inspection during and after manufacturing by either the contractor or Government requires unanticipated rework.

(d) Administrative problems encountered such as: alleged mistakes, unanticipated price increases, bankruptcies, specification uncertainties, etc.

(2) Government problems:

(a) Failure to award in accordance with offers received (e.g., price, delivery, minimum quantities, discount terms, part numbers, terms/provisions), thereby suspending performance by the contractor awaiting correction of award documents.

(b) Delay in award beyond the acceptance period specified by the contractor resulting in renegotiation and supplemental agreement modification.

(c) Contract administration delay in resolving contract problems.

(d) Specification, purchase item descriptions, quality assurance, uncertainties and delays.

(e) Administrative delays such as: late delivery of award, documents, unclear printed awards, computer input inconsistencies (award dates, FSCM), lack of timely follow-up on delinquencies.

4. HOW DO YOU ATTACK THE PROBLEM OF DELINQUENT DELIVERIES?

Background: Minimizing contract delinquencies is a goal shared by responsible areas of interest:

(1) Supply Operations - To develop realistic RDDs and realistic requisition quantities that will be developed into awards with the least adverse impact.

(2) Technical Operations - To provide complete technical data packages and quality assurance requirements.

(3) Buyers - To minimize the causes of delinquencies.

(4) Post Award -

(a) Performance section to follow up on contract delinquencies.

(b) Contract administration sections to resolve contract problems.

Discussion: Problems of delinquencies are attacked in the Post Awards Branch as follows:

(1) A follow-up by the Performance Section (PIBC) using reports on deliveries.

(2) Expeditious handling of contract administration problems (volume and resources considered) by the Contract Administration Sections (PIBA/PIBB).

(3) Negotiation and modification of delivery schedules on awards identified.

(4) Verification of total active contract file reports (F-71-3) with the contractor on an exception basis when indicators warrant.

(5) Visits to contractors for the purpose of reducing backorders/ delinquencies and promoting DISC interests.

e. HOW BAD ARE YOUR FORECASTS?

See answer in paragraph 4f.

f. DO YOU INTEND TO IMPROVE ON YOUR FORECASTS? IF SO, HOW?

(1) Determination of the best forecasting method is an age old pursuit and in most cases probably varies along with changes in the nature of the demand.

(2) The erratic nature of experienced demand on our items would probably make any forecasting method look bad. However, since the alternative involves changing user demand patterns, determination of optimum forecasting methods will remain a prime concern.

Discussion: The answer to the question of "How bad our forecasts are" involves the two major factors of demand fluctuation and forecasting method. An idea of the degree of demand fluctuation can be had from the RF-130. This summarizes changes in forecast over a 6-month period and provides information such as number of items having changes of 25 percent, 50 percent, and 100 percent. For example, 71 percent of all replenishment items had forecast differences of 25 percent or more from March 1979 to September 1979. This listing has lost its meaning since price changes now affect both the September and March stratifications.

(1) Another indicator of QFD accuracy is the RF-183, Tracking Signal Report, which provides summary statistics of number of items within and outside tracking limits.

(2) Both the RF-130 and RF-183 are indicators of QFD variance but give no indication of how much the forecasting method itself may have contributed to the variance.

(3) In reply to the question of, "Do you intend to improve on the forecasts?" the following applies:

(a) Recently a series of meetings between Supply Operations and Plans and Programs were scheduled to discuss exploration of alternative methods of QFD computation. Objectives involved smoothing the workload as well as improving forecast accuracy.

(b) Customer Projections. DISC actively encourages increased customer participation in the SPP program and utilizes other customer projections in many cases.

DISC Position: The prime factor in attempting to accurately forecast demand is the erratic nature of experienced demand. We don't think that our current forecasting system is inadequate, however, it is thought that

improvements can be made. DISC will continue to study alternatives. Significant improvements in forecasting, if possible, will probably be outside the traditional limitations of periodic recomputation and will involve inclusion of factors not now used in demand forecasting.

g. HOW COULD YOU REDUCE ALT?

Background: DISC-P has several on-going major projects aimed specifically at reducing ALT: the introduction of two local programs, the Automated Telex RFQ and the Prioritization of PRs, new additions and reorganized management of the SASPS I and II programs, and review of high dollar value procurements.

Discussion: The Automated Telex RFQ is a preimplementation of a major portion of the SAMMS Buyer Directed RFQ program. The ADP files being built for the Automated Telex RFQ will ultimately support the SAMMS program. The Automated Telex RFQ places a solicitation in the hand of vendors, complete with all terms and conditions, within one working day from the PR generation date. This solicitation, concurrent with the buyer receiving the PR, is yielding substantial PALT reduction and is geared to NSNs excluded from the SASPS program.

The new locally developed "Prioritization of PRs" program stratifies open PRs into significant groups which identify those items which are mission essential and impact most on supply availability. This identification will allow emphasis to be placed on contracting for those items most critically needed in the supply system, and permit efforts be directed to shortening their leadtime.

The SASPS I program at DISC was reinstituted in February 1981 with emphasis on placing successful orders with Original Equipment Manufacturers (OEMs) and their authorized distributors. While more limited in scope and volume than our previous efforts, our new approach to SASPS I is yielding high initial success, taking advantage of the system's one day PALT, and minimizing the "hidden" PALT of SASPS rejects on the manual PR workload.

Items previously excluded from SASPS II have recently been added to the system after technical review, thereby increasing the flow of small automated purchases at the expense of more costly, longer leadtime, manual contracting efforts. The continuing high success rate of SASPS II at DISC guarantees its advantage in faster processing of supply requirements.

Presolicitation review of high dollar procurements, including IDTCs is performed to ensure that the supply-generated milestones are consistent with proper contracting actions and time frames and reasonable in terms of scheduled completion and delivery dates.

DISC Position: Continued use of these contracting methods and their planned expansion will yield substantial improvement in ALT for the future.

h. [illegible] OUTSIDE OF SAMMS TO UPDATE LEADTIMES? DO YOU USE MARKET RESEARCH?

Background: Changes to PLT are normally computed mechanically; however, in order to ensure that the requirements computation is augmented by current changes to PLT, IMs revise PLTs when prompt revision is required.

Discussion: Revisions are made on the following:

(1) Recent awards,

(2) information from a Directorate of Contracting and Production (DC&P) source, and

(3) manual revisions also occur based on verification of PLTs by DC&P based on IM requests. These include:

(a) PLT has changed 60 days (+ or -);

(b) PLTs greater than 300 days prior to approving a RB; and

(c) PLTs greater than 200 days prior to approving a RB greater than $25,000.

DISC Position: Manual revisions to reflect up-to-date PLT are necessary to assure supply support and preclude backorders.

i. DO YOU HAVE KNOWLEDGE OF PROGRAM DATA WHICH YOU COULD USE IN FORECASTING?

Discussion: DISC does not have knowledge of program data which would be applicable at the DSC level for DISC materiel. We do not use programs such as Provisioning, SPR, and WSSP to support and forecast requirements. These, however, are not independently/internally generated program data.

(1) Provisioning and SPR: Forecasts/support data assigned by the customer are entered into our requirements computation.

(2) WSSP: Military service weapons systems managers identify items that are critical to the operation of specified major weapons systems. These NSNs are coded essential in the DISC system. In turn, DISC uses essentiality as one of the criteria for assigning an NSN to a SMCC category. The NSNs assigned to weapons-related SMCC categories usually received more support than they would as nonweapons.

DISC Position: DISC does not recognize the applicability of program data for DISC materiel at the DSC level.

j. DO YOU ADJUST COMPUTED PROCUREMENT CYCLES AND SAFETY LEVELS? IF SO, HOW?

See answer in paragraph 41

k. DO YOU REALIGN YOUR INVESTMENT DOLLARS OUTSIDE SAMMS? IF SO, HOW?

See answer in paragraph 41.

1. HOW DO YOU HANDLE BUDGET RESTRICTIONS?

Description of SMCC/VQF Procedure

DISC applies VQF support factors to SMCC-grouped NSNs to optimize system stock availability and control stock fund expenditures, while emphasizing weapons and FILL item support. The original concept was implemented in 1975. This technique has proven invaluable in times of constrained funding as well as a dependable and practical model for normal operations. Prior to implementation of the VQF model, DISC used various nonoptimal funds control policies including radical downward adjustments to safety levels and buy policies. Analysis of these actions, system demand characteristics, and item comparison studies indicated the potential of the VQF concept.

Each replenishment type NSN's category in the DISC SMCC matrix is determined by its Annual Demand Value (ADV), weapons and/or FILL, coding and Average Requisition Value (ARV). The goal of our SMCC categorization, and in particular, the use of ARV breakpoints, is to attain a significant separation of requisitions from demand or sales dollars. To highlight this separation, look at this sample of the breakout of high ADV weapons/FILL NSNs:

SMCC	No. Items	% Sys Sales $	$ Sys Reqns
G	984	1.65%	5.48%
I	1,249	3.03%	3.50%
K	4,190	21.50%	6.30%

For example, SMCC "G" and "K" each generate approximately the same number of requisitions, 5-6 percent of the system total; however, the system investment cost is much greater for SMCC "K." Thus, SMCC "G" items produce more system requisition support per dollar invested. It is this disparity among SMCC grouping which give us favorable trade-offs in applying VQF factors. Note that weapons/FILL items represent 62 percent of system requisitions and 51 percent of system sales dollars giving us a desirable natural separation.

Originally we used requisition frequency breakpoints to define SMCCs but later found that ARV gives better results based on maximum separation of requisitions and ADV. In both cases the SMCC breakpoints were established through analysis of system characteristics. Simulation tests substantiated the revision, indicating a 1 percent increase in system stock availability with the same commitment rate.

The methodology we use to determine VQF support factors by SMCC is as follows:

(1) Simulation Tests - Quarterly input data is collected for a sample of 5,000 items from our master files. Considering this current asset position and expected demand, simulation runs project commitment dollar expenditures and stock availabilities by SMCC for a range of VQF support levels.

(2) Optimization - The simulation data is used to develop a curve of optimum VQF support factors by SMCC, employing curve-fitting and Lagrangian

multiplier techniques (standard optimization techniques), for any given investment level. This concept recognizes the variability and uncertainty inherent in the computed QF for each item.

(3) Operational Policy - Once our budget position is established, management selects an operational VQF policy, adusting optimum VQF factors as required to reflect additional management goals, and operational limitations. A limited number of individual item deviations are permitted when there are compelling reasons, but only with the personal approval of the Director of Supply Operations.

The curves from steps (1) and (2) and the corresponding SMCC support factors are reviewed and revised by the Commander, DISC, creating an operational policy.

In summary, the SMCC/VQF model is a systems approach to maximize system stock availability for any funding level, with particular emphasis on weapons systems and FILL items. DISC's experience with this concept has been positive. It has been a factor in keeping our overall system stock availability relatively high despite periods of downward pressures due to extended leadtimes, reduced funding, and erratic demand. Our weapons and FILL average item stock availability has stayed three percent above that of other items. In addition it is a flexible and powerful management tool for controlling the commitment rate.

m. WHAT MANAGEMENT PROCEDURES/REPORTS DO YOU HAVE FOR ITEMS WITH BACKORDERS?

Background: Management procedures/reports for items on backorder applies to both system and to individual NSNs. Following discussion will follow this division, with further breakout by SAMMS and non-SAMMS. Sequencing of the procedures/reports is not intended to infer any ranking or comparison among those listed.

Discussion:

(1) System:

(a) SAMMS:

(1) DLA Supply Availability and Workload Analysis Report. Provides much monthly statistical data on system-wide basis. Data is source for RCS reports (see subject).

(2) DLA [illegible] Backorder Age Summary. Shows aging of backorders by NSC in nine age categories. Counts are sum of stocked and nonstocked SKUs.

(3) DLA [illegible] Requisitioned Supply Effectiveness Report [illegible] demands and backorders established by ESC.

(b) Non-SAMMS:

(1) Backorder Analysis Management Summary. Shows statistical data on backorders and NSNs with backorders by FSC for stocked backorders which are considered DSC chargeable backorders on Part 1 of F-67.

(2) Supply Management Category Codes (SMCCs). Shows demand, backorder, and availability by SMCC category codes.

(2) Individual NSNs:

(a) SAMMS:

F-31 - Listing of Items Placed on Backorder. Provides listing of all requisition line items currently on backorder.

(b) Non-SAMMS:

(1) CRCH-41 - Backorder Information as Related to High Frequency Items. Provides a listing of NSNs in descending backorder count sequence.

(2) Inventory Managers Brief. For selected items with rapid demand increases, inventory managers brief the items with the Director of Supply Operations after demand analysis and contact with users. This promotes improved demand forecasting and awareness.

(3) SMART Team Management. Transfer of selected items to a special DSOC Team of inventory managers, procurement and technical specialist, to reduce ALT and PLT.

(4) Flow Process Review. A management information technique to monitor the flow of paperwork through DISC. Delays at critical points in the flow of requisitions and supporting documents are discussed by the Commander and the Executive Committee.

(5) Daily Value Backorder Listing. A list of all backorder [illegible] with line [illegible] exceeding $50,000 is distributed to IMs for review and validation.

(6) Special Material Obligation Validation. In addition to the SAMMS edit [illegible] material obligations, inventory managers use off line correspondence to validate selected aged backorder lines for U.S. Forces. Experience shows desirable payoff, believed to be influenced by the personal versus mechanical response of the customer.

(c) Possible Improvements:

(1) Customer Advocate Program. Incorporated in the DSOC operation, personnel are designated as contact points to improve communication [illegible] to solve problems.

(2) Critical Backorders. Listing to identify [illegible] backorders that could be [illegible] and investigated at a higher level.

(3) Open Awards to Contractors. Listing to be forwarded monthly to contractors to enable regular vendor reconciliation with contractors and to reduce instances of nonreceipt of contract copies.

5. Follow-up: DISC personnel are sending us additional information regarding demand frequency and amount of backorders on new/provisioning items.

William R. Frazier, Jr

WILLIAM R. FRAZIER, JR, CAPT, USAF
Operations Research Officer
Operations Research Branch

APPENDIX D

DLA-LOO 25 August 1981

MEMORANDUM FOR RECORD

SUBJECT: HQ DLA Backorder Review Team Visit to DPSC

1. Background: On 25 August 1981, the HQ DLA Backorder Review Team paid a one-day visit to DPSC to discuss ways to reduce backorders with DPSC staff members from Medical, Clothing and Textiles, and Subsistence.

2. Purpose: The purpose was three fold:

a. To obtain analyses/studies conducted by DPSC in the past and which are still relevant to the topics of:

(1) backorders

(2) forecasting,

(3) requirement computations,

(4) leadtimes, and

(5) delinquent deliveries.

b. To obtain answers to 13 backorder-related questions raised by the HQ DLA Backorder Review Team.

c. To acquire copies of the following reports:

(1) "DPSC Stock Report,"

(2) Backorder reports,

(3) delinquency reports, and

(4) leadtime reports.

3. Participation:

a. HQ DLA Backorder Review Team. The following members of the Review Team participated in the visit:

Mr. [illegible] Clark, Jr., SAVA, AV 284-[illegible]
Capt. [illegible] Fraley, USAF, DLA-LOO, AV 284-[illegible]

b. DPSC. [illegible] personnel participated in the discussions at DPSC:

Medical: (DPSC-A)	Colonel Dino Pulcini	Chief, Supply Operations	AV 444-2146
	Sally Bird	Supply Operations	
	Walter Ranieri	Deputy Director-Medical	
	Ray Andrusko	Procurement	
	Major Frank Heim	Procurement	
	Ron Carfagno	Inventory Management Branch	
	Steve Sadler	Management Support Office	
	Bob Walls	Management Support Office	
Clothing & Textiles: (DPSC-T)	Bill Hoban	DPSC-TS	AV 444-3031
	Paul Zebrowski	DPSC-TS	
Subsistence: (DPSC-S)	Art Solomon	DPSC-S	AV 444-2903

4. Findings : The following questions were discussed by the Review Team and the DPSC staff members:

a. WHAT ARE THE CAUSES OF YOUR BACKORDERS?

DPSC-A

The three major causes of backorders are increased demands, contract delinquencies, and pre-award problems.

DPSC-T

Backorders are caused by unprogrammed demands (75.4 percent), contract delinquencies (13.1 percent), tariff turbulence (6.1 percent), and other causes (5.4 percent).

DPSC-S

The Subsistence commodity has virtually no backorder problem. No problem exists because of the perishable/nonperishable nature of the commodity and because of the substitutability option which is available for most requisitions.

b. HOW COULD YOU REDUCE BACKORDERS?

DPSC-A

We have reduced backorders through the following techniques which are now ongoing:

(1) Review and analysis of every item with 50 lines or more on backorder.

(2) Supervisory review of every item which receives a first-time or backorder notification.

(3) An informal meeting every Friday morning with Procurement, Technical, and Supply personnel to devise pet-wel plans for those items with the most lines on backorder and by their potential critical item.

(4) A monthly letter to our customers indicating the reason and estimated release date for every item with 40 lines or more on backorder.

(5) Continuation of six month procurement cycles to the extent possible within funding limitations.

(6) UMMIPS control levels.

DPSC-T

Backorders could be reduced in several ways:

(1) Buy GFM on no less than 12 month cycles.

(2) Either tighten up and enforce restricted GFM drawdown clauses or change the way requirements are portrayed on GFM buys.

(3) Increase current GFM level from one to three months.

(4) Reinstate qualified bidders list and remove poor contractors from list; e.g., Bianchi.

(5) Eliminate small business restrictions and encourage wider competition; e.g., dress coats.

(6) More accurate pre-award surveys; e.g., VIMil.

(7) Have factory test each size on new patterns and compare to old existing sizes to predict need for size tariff changes.

(8) Have all POIS pipelines verified with the Military Services; e.g., Marine Corps forecasting problem.

(9) Specification requirements are too restrictive; e.g., cloth shade problems on MC shirt cloth and Navy women's blue fabric.

(10) Strengthen standardization among the Military Services; e.g., Navy request to reintroduce OG 107 fatigues.

(11) Enforce adherence to terms of the contract by size, by delivery time frame.

(12) Clothing sales stores be advised to requisition only quantities required for levels not one or two year periods; e.g., Coveralls, Shipboard, Coat

(13) Establish edit policy to reject ZI requisitions. Recommend discount for item review and approval (scarves, sweaters, etc., many MLOs)

(14) Services be forced to use SPI procedures rather than unprogrammed requisitions; e.g., Case Map, MLOs to Project Reforger, and many other items in the category.

(15) Establish ad hoc committee to review mandatory items NIB-NISH-FPI. (Constant M/Os on Kit, Bag Flyers, and Tag, ID)

(16) Limited production on glove, T.A.P., glove Butyl. These items constantly on M/O for past five years, with M/Os of 600 and 2200 lines, respectively. Primary reasons for limited production, Norton Manufacturing Company has a determinative edit in the molds and equipment which precludes any other bidder's interest.

(17) Establish ad hoc committee to review many more items for possible requisition type contracts; e.g., United States National Flags.

(18) Supply Request Packages - EDOS established IAW procedures and based upon service submitted requirements by size. Any size turbulence not in line with service forecast results in M/Os. All M/Os should be cancelled with a revised EDOS. In order that full procurements are made to cover size or generic whichever the case. This size turbulence has bugged us many times.

(19) Request that DLA concur in permitting service not to submit requisitions to DPSC, until firm revised EDOS; e.g., Kit Bag Flyers and Jacket Flyers, and Insignias.

(20) Increase of basis of issue prior to notifing DPSC, resulting in M/Os for a long period of time, e.g.; Covecalls, Shipboard.

c. WHAT ARE THE CAUSES OF DELINQUENT DELIVERIES?

DPSC-A

Several causes of delinquent deliveries are:

(1) Contractor's inability to obtain ingredients, packaging materiels, etc. from suppliers.

(2) Lack of stability data which is acceptable to the Food and Drug Administration.

(3) Unacceptable first article from production run.

(4) Poor production planning.

(5) Plant overload.

(6) Absence of key personnel.

(7) Strikes.

(8) Natural catastrophes - fire, flood, ice storms, etc.

(9) Quality failure.

(10) Bankruptcies.

DPSC-T

Legal restrictions requiring use of small businesses. Laws that will not allow C&T to stop doing business with consistently delinquent contractors. Because of the nature of the commodity, about 80 percent of the awards go to small business.

d. HOW DO Y E ATTACK THE PROBLEM OF DELINQUENT DELIVERIES?

DPSC-A

The problem of delinquent deliveries is attacked by vigorous administration, insuring appropriate consideration reverts to the Government, assuring nonresponsible contractors are denied future awards, and processing T/D where necessary.

DPSC-T

The problem of delinquent deliveries is attacked by using the Directorate of Manufacturing, negotiations, size changes, local purchase, commercial procurement, and substitution.

e. HOW BAD ARE YOUR FORECASTS?

DPSC-A

We find our forecasts to be generally satisfactory. The only deficiency we have identified is that SAMMS does not allow for seasonal trends. Forecasts for seasonal items are always one step behind; while demand is increasing, SAMMS is predicting a decrease based on the just completed slump season. Likewise, SAMMS is unable to react correctly when the peak season is over and demands begin to fall off.

We have at least 90 seasonal NSNs. IMs make manual adjustments to these items of inventory based on their knowledge of the item.

DPSC-T

Forecasts are only as good as information received from the Services. For either new or major uniform changes, the leadtime is 36 to 42 months. More program data and better communication with the Services could improve forecasting.

f. DO YOU NEED TO IMPROVE ON YOUR FORECASTS? IF SO, HOW?

DPSC-A

We have no immediate plans in this area. We have just begun to consider possible approaches to the seasonal demand problem discussed in paragraph 4.e.

DPSC-T

We [illegible] to improve the [illegible] has with the Services to [illegible]

g. HOW COULD YOU REDUCE ALT?

DPSC-A

ALT has been reduced by the increased use of requirements contracts, the automatic placement of delivery orders against the Automated Federal Supply Schedule, and the increased use of the PETT system for placing small orders.

DPSC-T

ALT could be reduced by having fewer levels of review, by expediting the resolution of protests, by continuing the ten oldest P/R briefing, by having only an annual PSC clearance, and by having the authorization to override a COC protest, if the second low bidder is a small business firm.

h. DO YOU USE PROCEDURES OUTSIDE OF SAMMS TO UPDATE LEADTIMES? DO YOU USE MARKET RESEARCH/PRODUCTION RESEARCH?

DPSC-A

No, except on an exception basis when IMs make changes to specific items based on their knowledge of unusual circumstances.

DPSC-T

All procurements in excess of $100,000 are reviewed by an industrial specialist prior to solicitation.

i. DO YOU HAVE KNOWLEDGE OF PROGRAM DATA WHICH YOU COULD USE IN FORECASTING?

DPSC-A

No, we do not have knowledge of program data which we could use in forecasting.

DPSC-T

Program data which is used in forecasting relates to military strength, recruit input projection, and ship construction.

j. DO YOU ADJUST CONSTANT PROCUREMENT CYCLES AND SAFETY LEVELS? IF SO, HOW?

DPSC-A

(1) Yes, we adjust procurement cycles for items with requirements contracts.

(2) We increase procurement cycles for items which require multi-year contracts. This would be one of the disposable systems to correct their chronic backorder problems. Multi-year contracts were developed to align our requirements with the contractors production schedule. The schedule had been so far in advance of our procurement cycles that the contractor could not meet

our delivery dates on time. The change to a multi-year contract for these items also served to broaden the procurement base and open bidding to more companies.

(3) We reduce safety levels on shelf life items to allow stock rotation.

DPSC-T

(1) C&T adjusts safety levels according to its SOP 4140.26. Under the provisions of this SOP, C&T has fixed safety levels, variable safety levels, priority control levels, and a safety level adjustment program. The safety level adjustment program is implemented by the item manager, who uses a manual technique to determine the need to increase or decrease the fixed safety level on an item.

(2) C&T adjusts procurement cycles according to its SOP 4140.17. Under the provisions of this SOP, procurement cycles are periodically reviewed based upon the pertinent item category.

k. DO YOU REALIGN YOUR INVESTMENT DOLLARS OUTSIDE SAMMS? IF SO, HOW?

DPSC-A

No, we do not realign investment dollars outside of SAMMS.

DPSC-T

This question does not apply, since C&T does not operate within the SAMMS structure yet.

l. HOW DO YOU HANDLE BUDGET RESTRICTIONS?

DPSC-A

We would selectively reduce procurement cycles on items which had reached reorder point. This would increase the probability of backorders on those items and is only a short term solution since the same amount of stock would eventually have to be purchased. Other by products would be an increased contracting workload and the resulting PALT growth.

DPSC-T

Budget restrictions would be handled by reducing safety levels and by reducing procurement cycles.

m. WHAT MANAGEMENT PARTICIPATION DO YOU HAVE FOR [illegible] TO BACKORDERS?

DPSC-A

See answer to paragraph 4.b.

Three management reports used by C&T personnel for the management of items with backorders are the "Daily Report of Materiel Obligation Variance," the "Consolidated Weekly Material Obligations Listing," and the "Monthly List of Material Obligations over 90 and 180 Days Old."

5. Follow-up: DPSC personnel are sending us additional information regarding demand frequency and amount of backorders on new/provisioning items.

William R Frazier Jr

WILLIAM R. FRAZIER, JR, CAPT, USAF
Operations Research Officer
Operations Research Branch

APPENDIX E

DLA-LOO 27 August 1981

MEMORANDUM FOR RECORD

SUBJECT: HQ DLA Backorder Review Team Visit to DESC

1. Background: On 27 August 1981, the HQ DLA Backorder Review Team paid a one day visit to DESC to discuss ways to reduce backorders.

2. Purpose: The purpose was threefold:

a. To obtain analyses/studies conducted by DESC in the past and which are still relevant to the topics of:

(1) backorders,

(2) forecasting,

(3) requirement computations,

(4) leadtimes, and

(5) delinquent deliveries.

b. To obtain answers to 13 backorder-related questions raised by the HQ DLA Backorder Review Team.

c. To acquire copies of the following reports:

(1) SAMMS E-06 Report,

(2) backorder reports,

(3) delivery reports, and

(4) leadtime reports.

3. Participation:

a. By DLA Backorder Review Team. The following members of the Review Team participated in the visit:

Mr. Dennis L. Thompson, DLA-LOO, AV 284-7227, Team Leader
Capt William W. Frazier, Jr., USAF, DLA-LOO, AV 284-7227
Mrs. Elizabeth L. Cohn, DLA-LOF, AV 284-6183

b. DESC Staff Members. The following DESC personnel participated in the discussion of backorders at DESC:

Mr. Robert Peyton	DESC-C	AV	850-5381
Mr. William Szwec	DESC-CB		850-5221
Mr. Bernard Kenecht	DESC-DB		850-5381
Col James Butterworth, USAF	DESC-L		850-6155
Lt Col Palmer Smith, USAF	DESC-LO		850-5064
Mr. Robert Gumbert	DESC-LO		850-6157
Mrs. Louis Fish	DESC-LO		850-5295
Mr. Robert Dawson	DESC-LO		850-5295
Mr. Robert Gaeke	DESC-LS		850-5525
CAPT Wayne Cox, USN	DESC-O		850-6135
Mr. George Young	DESC-O		850-6135
Mr. Donald Cress	DESC-OM		850-5169
Col John Andrews, USAF	DESC-P		850-6115
Mr. Mike Haines	DESC-P		850-6117
Ms. Frances Berry	DESC-PM		850-6261
Mr. Joe Burneka	DESC-PMB		850-6261

c. Entry Interview. Upon arriving at DESC, the Review Team met with BGEN Anthony F. Albright, USA, Commander of DESC, and discussed the purpose of the review.

4. Findings : The following questions were discussed by the Review Team and the DESC staff members:

a. WHAT ARE THE CAUSES OF YOUR BACKORDERS?

The chief causes of backorders according to a DESC report (December 1980) which was based on two previous backorder studies--The Report of the Backorder Study Group and The Study on National Stock Numbers (NSNs) in the Top 100 Backorder Positions--are:

(1) increased demand,

(2) capitalization (dry pipeline),

(3) extended leadtimes, and

(4) contract delinquency.

The major contributor to backorders is increased demand. A subsequent DESC report based on the reason for NSNs going on backorder for the first time using January-March 1981 data confirmed the earlier findings. The only major change in the reasons for backorders since these statistics were gathered has been in the addition of the figure for backorders caused by stock lost during the Dayton Depot closure. Based on the end of July 1981, figures consisting of a breakout of NSNs on backorder but excluding the number of NSNs attributed to the relocation, DESC found that the four chief causes of backorders had not changed. Increased demand was still the overwhelming problem.

b. HOW COULD YOU REDUCE BACKORDERS?

DESC is testing one new program and has proposed two others:

(1) DESC has developed a Potential Backorder Program (PBP) which was implemented 1 September 1980 and is being tested for one year. The PBP was programmed to identify the NSNs with the greatest number of Potential Backorder Lines (PBL) in time for corrective action to be taken so that actual backorder lines will not materialize on the NSNs.

(2) In May 1981 DESC proposed a Variable Safety Level (VSL) change. This proposed change is based on using a normal leadtime demand distribution to replace the negative exponential leadtime demand distribution presently used in the VSL. This change offers the potential for decreasing safety level investment with a concurrent decrease in backorder lines, given the same level of projected commitments over a two-year period.

(3) In April 1981, DESC proposed a SAMMS Tracking Signal Modification on using standard deviation of leadtime demand. They proposed a methodology for calculating a leadtime standard deviation to be used in a reformulated tracking signal and a corresponding VSL not dependent on smoothing factors. [illegible] using demand items should occur with no effect on the VSL according to the DESC staff.

(4) The review team received a briefing on the DESC Wide Backorder Study Report that was completed on 31 July 1980 by the Stock Fund Financial Planning Committee. This committee examined several proposals to reduce backorders.

c. WHAT ARE THE CAUSES OF DELINQUENT DELIVERIES?

DESC reported the following reasons for delinquent deliveries:

(1) Contractor mismanagement of resources and/or information may result in the contractor being delinquent in performing awards/contracts.

(2) [illegible] insufficient quantities for normal production runs may result in the contractor waiting until he has enough orders for a normal run. The converse of this are the occasions when a contractor is awarded several orders [illegible] creating backlogs in his production.

(3) [illegible] where government orders are a very small part of a contractor's business, DESC orders take a backseat to more "important" accounts such as the automotive industry, original equipment manufacturers' accounts, a manufacturer's own needs, or [illegible] order which [illegible] services.

(4) [illegible] after deliveries [illegible] from [illegible] obligations.

[illegible] DELIVERIES?

[illegible] number of different ways.

[illegible] individual basis [illegible]

AD-A125 791 REPORT OF BACKORDER REVIEW(U) DEFENSE LOGISTICS AGENCY 2/2
ALEXANDRIA VA OPERATIONS RESEARCH AND ECONOMIC ANALYSIS
OFFICE D L ZIMMERMAN ET AL. NOV 81

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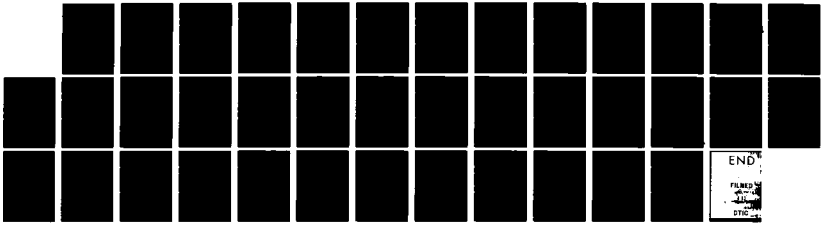

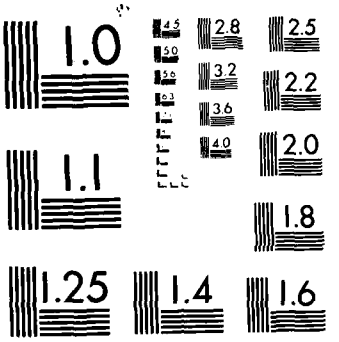

MICROCOPY RESOLUTION TEST CHART
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consideration being offered by the contractor. If a new schedule cannot be established or if the new schedule and/or consideration are not acceptable to the Government, the purchase order may be withdrawn or the contract may be terminated for default. This information on the contractor's performance is provided to the buying office by the Production Division. If the contractor persists in being delinquent in performing orders/contracts, the contract administration office may request that a pre-award survey be performed to determine the contractor's ability to perform on contracts. The contract administration office may request that the buy offices require two signature contracts on all awards and/or remove the contractors from automatic selection in Phase I and II.

(2) The procedures for DLA Form 1128, Procurement Subsystem Amendment Data Transcript Sheet (YPE/YPM Supplement), expediting delivery have been revised by DESC. The changes were made in an effort to reduce the Form 1128 volume going to procurement and to limit the use of this form to those that have the most impact.

(3) DESC has drafted a priority handling procedure for initiating and processing the Request for Delivery Acceleration.

(4) The Critical Item Review is DESC's management method utilized to identify items that are severely impacting supply support. Each month an average of 20 critical items requiring command interest are selected for presentation to the Critical Item Review Board. Benefits derived from this process are accelerated deliveries, expedited actions on contract awards, identification of substitute items, direct communications/cooperation, and awareness by management up to Command level of those items or situations which have a serious impact on supply support.

(5) After determining that delivery is an essential element in the evaluation of offers, DESC implemented a procedure in which delivery was used as an evaluation factor. In order to present a uniform position to industry, DESC has been furnishing buyers in the manual buy branches certain guidelines for considering an award to other than the low bidder in order to get a delivery schedule that satisfies or more nearly satisfies the RDD.

c. HOW BAD ARE YOUR FORECASTS?

DESC states that DAMIS forecasting has been a concern at DESC for several years. Low value forecasting has generally decreased yet both backorders and inapplicable assets (total assets above stockage objective) have risen. The generation of inapplicable assets in this category is largely due to migration from high and medium value categories. Medium value forecasting has remained fairly stable as has inapplicable assets, yet backorders continue to increase. High value forecasting has maintained a very high level (due in part to the trend responsiveness program) yet the percent of demand on backorder has remained very high. Inapplicable assets are stable since, as demand falls off items migrate to the lower categories.

f. DO YOU INTEND TO IMPROVE ON YOUR FORECASTS? IF SO, HOW?

See the programs identified in paragraph 4b.

8. HOW COULD YOU REDUCE ADMINISTRATIVE LEADTIME?

(1) DESC-L is using their Potential Backorder Program (Procurement) mentioned earlier in paragraph 4b, to identify items that will be in backorder position at a specified date; i.e., to identify the "potential backorder lines." The program will produce a potential backorder listing once a month that will list 1,000 NSNs in descending order by the number of potential backorder lines. The IMs will review these printouts, and they will, depending upon certain circumstances, send one or more IOMs to DESC-PA, DESC-PE, and/or DESC-S requesting various actions that may preclude the potential backorder situation from occurring. Upon receipt of the PBP inter-office memorandum, the buyers, contract specialists, and contract reviewers are asked to follow specified guidelines. This potential backorder test will run for one year from 1 June 1980. DESC is currently conducting a review on the forecasting model for this PBP program along with studies on other models to determine the one that would project the most accurate requirements. They will submit a final report later on this year for this one-year test program which will also include an evaluation to determine the effectiveness of the program.

(2) The Spot Buy procedures, listed as part of the Electronic Contract Regulation, is a DLA program that is used to reduce ALT for urgent requisitions.

(3) To reduce ALT, DESC has authorized overtime. They reported that overtime has been authorized since 1977 and greatly increased in 1980 and 1981 to try to compensate for over 50 percent turnover in experienced personnel. DESC also offered the following suggestions as possible alternative solutions for reducing ALT:

(a) If contracting officers had more lee-way in determining buy quantities, ALT could be reduced in some cases up to five days or the time it takes an IM to obtain an NSN study and review the item.

(b) A contributor to ALT is backlog in the buying office. This could be relieved by additional manpower and a leveling out of the number of PRs received in a quarter. Historical data for the number of PRs received in the first month of each quarter compared to the total in a quarter show that in most cases 40 percent to 50 percent of the PRs received in a quarter were received in the first month of the quarter (based on FY 78-FY 81 data).

(4) Two DESC leadtime studies could also provide solutions to reducing ALT:

(a) The Impact of Printing and Reproduction Effectiveness on Contracting Administrative Lead Time, and

(b) The MATE Line Study.

9. ARE ANY PROCESSES OUTSIDE OF SAMMS TO UPDATE LEADTIMES? DO YOU USE MARKET RESEARCH/PRODUCTION RESEARCH?

DESC does not use any procedures outside of SAMMS to update leadtimes. They are updated individually by IMs as they see fit. Market research/ production research is not used by DESC.

i. DO YOU HAVE KNOWLEDGE OF PROGRAM DATA WHICH YOU COULD USE IN FORECASTING?

DESC does not have any knowledge of program data that would be useful in forecasting.

j. DO YOU ADJUST COMPUTED PROCUREMENT CYCLES AND SAFETY LEVELS? IF SO, HOW?

(1) Concerning procurement cycles, DESC is buying a maximum of 36 months on low value items. On all SMCC A and C items they have a minimum 6-month procurement cycle. On SMCC A and C items with less than 30 days saftey level and increasing demands, the IMs are authorized to buy 12 months procurement cycle. The latter is temporary during the fourth quarter of FY 81 only. Concerning safety level, a zero safety level has been input and inhibited on all DMS items.

(2) DESC recently (June 1981) surveyed the Price Break Program in order to determine whether, and to what degree, that program was contributing to over procurement dollars. The results of this survey indicate that, in most cases, IMs chose the program "best buy" quantity which was justified by subsequent demand experience. Even in most of those cases in which IMs chose a quantity other than the "best buy" quantity, the IMs choices were born out by late demand experience. However, in a few instances where IMs had neglected to adjust QFDs to correspond to recorded demand trends the dollars above Stockage Objective Requirements (SOR) were inflated on some items.

(3) DESC also used the Price Break Program and First Article Buys and the Buy Processing procedures.

k. DO YOU REALIGN YOUR INVESTMENT DOLLARS OUTSIDE SAMMS? IF SO, HOW?

DESC uses the following four steps:

(1) Exclude DMS items from VSL.

(2) Adjust procurement cycle/EOQ mechanically:

High value 20 + frequency = 6 month procurement cycle
Medium value 20 + frequency = 12 month minimum

(3) Adjust procurement cycle manually:

Price break
Recomputation at award (high dollar contracts)
Level-load requirements

(4) Adjust Gen. IM judgment (trend, length of base, etc.)

l. HOW DO YOU HANDLE BUDGET RESTRICTIONS?

A simulation program is being developed by DESC-LO to provide dollar/workload impacts of various possible procurement cycle alternatives on short notice in event of future fund restrictions. DESC reported that they

would generally avoid budget restrictions by justification of revised requirements or, if phasing problem, advancement against approved program. If it is a simple end-of-year shortage of small size, then their first consideration is to delay a few very large buys until 1 October to allow maximum number of PRs to process, etc. or to permit all buys to suspend for one or two cycles if necessary. Temporary restrictions are handled by selective procurement cycle reduction involving least number of items/least supply support risk possible.

m. WHAT MANAGEMENT PROCEDURES/REPORTS DO YOU HAVE FOR ITEMS WITH BACKORDERS?

Backorder statistics are available as part of three local DESC reports.

(1) The Management Data Book basically contains monthly management data. Tables display backorder data in addition to workload, personnel and other data by Center, Service and other data elements.

(2) The Monthly Management Information Review uses graphs to display monthly data covering the current and previous fiscal years. These graphs allow the reader to identify trends in areas such as backorders, AWT, and other areas.

(3) The Daily Operations Report is a one page daily report that includes requisition volume backorder data. It gives figures for net demand, backorders established, backorders released/cancelled, stock availability, backorders on hand, and backorder change (+/-).

n. Follow-up: DESC personnel are sending us additional information regarding demand frequency and amount of backorders on new/provisioning items.

William R. Frazier, Jr

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APPENDIX F

DLA-LO 28 August 1981

MEMORANDUM FOR RECORD

SUBJECT: HQ DLA Backorder Review Team Visit to DESC

1. Background: On 13 August 1981, the HQ DLA Backorder Review Team paid a one-day visit to DESC to discuss ways to reduce backorders.

2. Purpose: The purpose was threefold:

a. To obtain analyses/studies conducted by DESC in the past and which are still relevant to the topics of:

(1) backorders,

(2) forecasting,

(3) requirements computations,

(4) leadtimes, and

(5) delinquent deliveries.

b. To obtain answers to 13 backorder-related questions raised by the HQ DLA Backorder Review Team; and

c. To acquire copies of the following reports:

(1) "[illegible] Report,"

(2) Backorder reports,

(3) Delivery reports, and

(4) leadtime reports.

3. Participation:

a. HQ DLA Backorder Review Team. The following members of the Review Team participated in the visit:

Mr. Dennis L. Zimmerman, DLA-LOO, AV 284-7227, Team Leader
Capt. William Frazier, [illegible], USAF, DLA-LOO, AV 284-7227
Mrs. Eleonore Swim, DLA-LOE, AV 284-6133

b. DCSC Staff Members. The following DCSC personnel participated in the discussion of backorders at DCSC:

Terry G. Blatter	DCSC-CB	AV 850-2159
Gary D. Harris	DCSC-LA	AV 850-2207
Mark Weinstein	DCSC-LA	AV 850-2207
Luther Atkins	DCSC-LI	AV 850-2745
Ken Payne	DCSC-O	AV 850-3121
Brian W. Hinkle	DCSC-OM	AV 850-3185
Steven E. Haynes	DCSC-OM	AV 850-3673
Stuart Clayton	DCSC-OM	AV 850-3031
Doris E. Dye	DCSC-PM	AV 850-4115
Stephen F. Leudt	DCSC-PMP	AV 850-2927
Jerry L. Becknell	DCSC-PP	AV 850-2211
Tom Hans	DCSC-SM	AV 850-2745

c. Exit Interview. Before leaving DCSC, the Review Team met RADM H. C. Donley, Jr., SC, USN, Commander of DCSC, and discussed the purpose of the review.

4. Findings : The following questions were discussed by the Review Team and the DCSC staff members:

a. WHAT ARE THE CAUSES OF YOUR BACKORDERS?

DCSC stated that in their continual assault on backorders, they had made a comprehensive study on this problem. The results of this study were presented to us in a briefing. As part of that study, DCSC looked at 800 NSNs that were afflicted by backorder problems. There were 400 selected from classes with less than 90 percent stock availability and the other 400 from NSNs that had 25 or more lines backordered. The backorder statistics which DCSC collected were on all outstanding requirements as of the study date (15 March 1981). The leading causes of backorders, by NSN, were found to be:

(1) increased demand (22.6 percent),

(2) policy backorders for FMS and war reserves - type 5 and 6 (16.6 percent)

(3) delinquent contracts (12.2 percent)

(4) ALT/PLT low (6.3 percent)

(5) former CISP/CESP (6.3 percent)

(6) significant inventory loss (5.1 percent)

(7) cancelled contracts (5.3 percent)

DCSC also mentioned that provisioning items caused backorders. They had found that provisioning items gained over the past 12 months were responsible for 3.5 percent of all backorders of type 1 and 2 and that this percentage was 9.1 percent over the past 24 months.

b. HOW COULD YOU REDUCE BACKORDERS?

Recommendations for reducing backorders were offered for each of the leading causes of backorders identified in paragraph 4.a. above.

(1) increased demands

(a) increase review cycle

(b) check for added provisioning/IMC data

(c) obtain forecasts from large users

(d) adjust alpha factor/VIP code

(2) policy backorders

discontinue type 5 and 6 backorders against NSN BB count

(3) delinquent contracts

(a) take off-setting actions

(4) ALT/PLT low

(a) use FSC average for items not purchased in two years

(b) increase current outstanding buys

(c) written procedures published for processing ALT and PLT list (P-III)

(d) IMs maintain ALT/PLT log on all folerized items

(e) continue monitoring by MSO

(5) former [illegible]

verify item to ensure correct factors are in the record

(6) significant inventory loss

(a) modify current procedures/criteria for investigating asset losses

(b) identify items with zero balance at Navy locations for which positive adjustments are received

(7) [illegible]

[illegible] additional staff support to the [illegible]

[illegible] off-setting actions to recover assets.

(c) as possible, DCSC-P refrain from giving awards to defaulting vendors

Other recommendations based on DCSC's backorder analysis were:

(1) run BB/on-hand asset list on quarterly or semi-annual basis

(2) run BB/nonstock list on quarterly or semi-annual basis

(3) increase emphasis by DLA on accurate and timely provisioning data

c. WHAT ARE THE CAUSES OF DELINQUENT DELIVERIES?

DCSC reported the following causes of delinquency. They are listed in decreasing order of importance; i.e., number 1 being the leading cause of delinquency and number 10 the least.

(1) subcontracting delays,

(2) contractor overloading,

(3) technical/quality problems,

(4) government clerical errors,

(5) contractor clerical errors,

(6) shipping/inspection problems,

(7) raw materiel shortages

(8) labor problems

(9) noneconomic runs (productions runs), and

(10) late or nonreceipt of awards.

d. HOW DO YOU ATTACK THE PROBLEM OF DELINQUENT DELIVERIES?

To keep delinquency rates lower, DCSC is doing the following:

(1) continually bringing contractors in for meetings at DCSC;

(2) sending executive level letters to contractors who cannot visit;

(3) assigning project managers to severe problem contractors;

(4) concerted Division level involvement;

(5) increased DMS Officer involvement and other assistance to contractors and their subcontractor(s);

(6) aggressive problem resolution;

(7) minimizing delivery extensions;

(8) minimizing extension time when delivery must be extended;

(9) timely terminations for default;

(10) timely cure notices, show cause letters and follow through actions;

(11) mailing Production Surveillance forms, as well as F-38 and F-39 lists to contractors and taking follow through actions;

(12) locating alternate sources and substitute items;

(13) close interface with IMs;

(14) production specialists alerting contract administrators to potential problems as they become known;

(15) strengthening procedural requirements;

(16) Intensified management of firms who are major contributors to delinquency (Top 100);

(17) informing top company management of their deliquency posture and requiring they take affirmative actions to reduce and maintain a low delinquency profile;

(18) placing contractors who continue to maintain a high deliqnuency rate on Award Check List, which will prevent the vendor from receiving an award/or require all of his awards to be two party agreements (this Award Check List is unique to DCSC);

(19) validating need for delinquency items;

(20) establishing 38 MBO goals;

(21) keeping close control of incoming correspondence and answering it promptly; and

(22) High level of concern over delinquencies at all levels of management

e. HOW BAD ARE YOUR FORECASTS?

DCSC reported that SAMMS forecasts are poor; that current methods cannot keep up with demand and that improve forward projection of demand trend is needed.

f. DO YOU [illegible] IMPROVE YOUR FORECASTS? IF SO, HOW?

DCSC has not found any alternative forecasting method that is better [illegible]. However, they believe that program data will improve current forecasting results.

g. HOW COULD YOU REDUCE ALT?

DCSC reported that to reduce ALT, they are doing the following:

(1) using a system of color-coded folders to assign PR processing priority;

(2) requiring documentation from other than coded sources that the offeror is an authorized dealer of the coded source or other proof that the genuine repair part (article) will be furnished;

(3) using letter contracts to the maximum feasible extent when going sole source;

They also made the following recommendations:

(1) hire more people;

(2) extend current threshold from $500 to $1,000 for procurements without requiring an attempt to obtain competition;

(3) increase current limitation on small purchase procedures from $10,000 to $25,000

(4) increase threshold for requirement of cost or pricing data for noncompetitive acquisitions from $100,000 to $500,000; and

(5) see recommendations listed in paragraph 4.b.(4).

h. DO YOU USE PROCEDURES OUTSIDE OF SAMMS TO UPDATE LEADTIMES? DO YOU USE MARKET RESEARCH/PRODUCTION RESEARCH?

The answer to both questions was "no." However, a summer student at DCSC published a monthly research report called, "The DCSC Market Outlook" which discussed critical items as well as general information to the IMs.

i. DO YOU HAVE KNOWLEDGE OF PROGRAM DATA WHICH YOU COULD USE IN FORECASTING?

Program data is used on an exception basis only. DCSC has an end item application data file called the Procurement Technical Data File (PTDF), a local data file consisting of specifications, part numbers, OEM drawings, histories, and end item application.

j. DO YOU ADJUST COMPUTED PROCUREMENT CYCLES AND SAFETY LEVELS? IF SO, HOW?

DCSC follows the procedures outlined in SAMMS.

k. DO YOU REALIGN YOUR INVESTMENT DOLLARS OUTSIDE SAMMS? IF SO, HOW?

Outside of SAMMS, DCSC has established a monthly financial plan which relates commitment authority to initiations. It is a detailed planning document similar to a budget execution plan

l. HOW DO YOU HANDLE BUDGET RESTRICTIONS?

Depending upon the severity, DCSC would develop techniques to maximize stock availability. One technique might be: reduce review cycles and set a buy priority. Example: Cover weapons systems items first; high demand items (100 or more per year) second; if any funds left, drop to 50-99 demands per year.

DCSC has available a mechanized program which attempts to maximize availability through a variable OFD concept.

(1) The program contains a management policy table which identifies groups or items to receive larger than normal OFDs so the net result is the same commitment requirement as if all items had a normal OFD.

(2) Preliminary operations research simulations are required to determine how to set the management policy tables. Basically, the concept increases OFDs on low unit price/high frequency items and reduces OFDs on high unit price/low frequency items.

(3) DCSC has not used this program since December 1978. IMs tend to resist this concept when they are the manager of items which get the reduced OFDs; if their performance, in part, is determined by their number of backorders and percent of supply availability.

m. WHAT MANAGEMENT PROCEDURES/REPORTS DO YOU HAVE FOR ITEMS WITH BACKORDERS?

(1) "Commander's "10" Most Wanted Program." Initiated by DSO, it provides visibility of the 10 "worst" NSNs for the month. These are not necessarily the 10 NSNs with the most lines on backorder, other factors such as procurement difficulties and potential for a lengthy backorder situation are also considered. After all possible efforts have been made on an NSN, it may be replaced by another NSN so that the same NSNs do not appear month after month.

(2) "Critical Item Review Program." Critical item sheets are prepared by IMs for items with certain backorder line count. Each IM Division sets its own criteria; one Division specifies 2% or more lines, the other 41 or more lines. Upon receipt of the sheets, certain "intensive management" procedures are required; i.e., requests for end item application, possible substitutes, accelerated/partial delivery. The NSNs appearing on the first four pages of the CRCR-41, Part I-A (Dep 190) are presented to the IM Division.

(3) Fast Pay Program. This program was started in January 1981. The IM [illegible] Fast Pay Backorder Notification [illegible] reason for backorder and forwards them to the management support office for compilation.

(4) [illegible] Stock Report. This report lists all backorders [illegible] established against stocked NSNs for 4 weeks. There are [illegible] separately: (1) [illegible] and (3) NSN sequence. It is primarily used by management support office personnel to provide [illegible] the Weekly Operations Review but [illegible] been used to identify [illegible] lines on backorder for action by IM management [illegible].

(5) "CRCH-41, "Backorder Information as Related to High Frequency Items." This is a monthly report with two parts. Part I-A lists the NSNs in descending order of lines on backorder. Part I-B's major sequence is ORC with number of lines on backorder as minor sequence. Each IM Division receives a complete copy of each part as does the management support office.

5. Follow-Up: DCSC personnel are sending us additional information regarding demand frequency and amount of backorders on new/provisioning items.

William R. Frazier Jr.

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APPENDIX G

Literature

Source: Department of Defense

1. TITLE: Draft Report on the Review of the Management of Materiel Obligations at the Defense Supply Centers (DSCs)

PERFORMING ORGANIZATION: Defense Audit Service

DATE PUBLISHED 9 March 1981

ABSTRACT: We reviewed the management of materiel obligations (backorders) at the DSCs to evaluate the effectiveness of operations and to determine if the Centers' procedures complied with DoD and Defense Logistics Agency (DLA) regulations. A backorder is a requisition for materiel that is not immediately available but is recorded as a commitment for future issue either by direct delivery from a vendor or backordered from stock. The volume of backorders for items stocked in the DLA distribution system has grown by almost 50 percent in the last three years to 390,000 requisitions at the end of FY 80. During this period, requisition volume for stocked items was relatively stable at about 1.6 million monthly. For FY 80, the DLA goal was to limit backorders to 236,000 requisitions.

We concluded that, generally, individual requisitions that must be backordered are handled in a responsible and effective manner. The average number of days to release a backorder from the Centers' records was 70 days during FY 80, the averages ranging from 40 to 90 days during this period at the Centers we reviewed. However, we found several conditions that are contributing to the increasing backorder management volume that should be corrected and some Center procedures involving backorder management are not in compliance with DoD regulations.

The analyses of the causes of backorders generally paralleled those identified by officials at the Centers. Many resulted from erratic and increasing demand patterns, late receipt of support requests from requisitions, or other reasons beyond the control of the inventory managers. However, we found that many line items in a backorder position remained out of stock for inordinate lengths of time. Over 70 percent of the 253 items in our test with high value backorders were still in this position over one year later. The data systems and procedures at the Centers are geared to daily operations and do not identify for evaluation the backordered position for stock items in order to correct the inventory or supply position. We also found that the Centers' procedures to monitor item management codes (IMC), when significant changes occur in ELT, were not effective. Additionally, for at least one of the inventory managers, the Defense Industrial Supply Center (DISC), demand forecasts for backordered items normally stocked were not adequately supported in their automated programs, which contributed to out of stock conditions. DISC accounted for about 46 percent of DLA's backorders.

Procedures for processing pending purchase actions when backorders are cancelled need to be improved. We found about 10 percent of the cancellations in

our test awards had not been made and procurements could have been stopped. We estimated that at the Defense General Supply Center (DGSC), purchases totalling $985,000 could have been avoided. Contrary to the DoD regulations governing the materiel obligation validation program, procedures at the Defense Personnel Support Center (DPSC) excluded backorders for nonstandard and nonstocked clothing and textile items and no action was taken to cancel purchase actions for the medical commodity. In addition, we believe that a limited extension of the Centers' internal cut-off dates for processing validation responses would lessen the impact of delayed backorder validations, especially for deployed requisitions.

Because of an average requisition quantity criteria used in mechanized programs at the Centers, lesser priority requisitions were released before high priority requirements. For the clothing and textiles commodity, a local program was used which released backorders in ascending requisition quantity sequence, ignoring relative priorities. These procedures violate the provisions of the DoD uniform priority system and result in delays in shipment of supplies to customers having the greatest need. In addition, automated procedures at the Centers did not establish a control level of assets of critical supply materiel to satisfy only high priority requirements, as required by the DoD regulations.

2. TITLE: FY 81 Materiel Budget Execution Plan

PERFORMING ORGANIZATION: Ships Parts Control Center (SPCC)

DATE PUBLISHED: 30 September 1980

ABSTRACT: This plan documents the Navy SPCC policy and strategy for executing the FY 81 materiel budgets.

3. TITLE: FY 81 Budget Execution Plan

PERFORMING ORGANIZATION: Naval Supply Office (NSC)

DATE PUBLISHED: 30 October 1980

ABSTRACT: This plan focuses the attention of all levels of NSO management on the command goals and the prescribed methodology for their attainment.

4. TITLE: Stockage Policy Analysis

PERFORMING ORGANIZATION: Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics) (OASD(MRA&L))

DATE PUBLISHED: January 1981

ABSTRACT: The Office of Management and Budget (OMB) review of the FY 82 defense budget resulted in the preparation of several OSD staff issue papers setting possible alternatives to management of the Defense Department. In particular, [illegible] identified several areas that believed logistics management practices were

possible. This paper concluded that DoD should reassess certain existing supply policies and practices, emphasize incentives to improve inventory management controls, and reduce certain inventories maintained as "hedge" against unforeseen variations in usage. In response to the OMB issues, a Secondary Item Stockage Policy Analysis effort was initiated on 13 August 1979 by an OASD(MRA&L) memorandum which established a Joint Steering Group to oversee the analytical efforts on an in-house ad hoc working group. This working group, composed of representatives of the Components and OASD(MRA&L), was chaired by the Staff Director, Supply Policy and Programs Division, OASD(MRA&L).

Source: Defense Logistics Agency

TITLE: An Analysis of Contract Delinquencies - Draft Report

PERFORMING ORGANIZATION: Headquarters, Defense Logistics Agency

DATE OF REPORT: November 1980

[illegible] study was undertaken primarily to determine the causes of continuing low DLA contract delivery effectiveness rates and the resulting adverse impact on the timely supply of both stocked and direct delivery items.

A random sample of 200 delinquent contract line items was taken at each hardware center (DCSC, DESC, DGSC, DISC) and these were closely examined by having the Centers fill out a detailed questionnaire on each item. Overall, 22 percent of the delinquencies examined were Government-caused. Two major problem areas identified were late or nonreceipt of awards and administrative/clerical errors. Also, the Government contributed significantly to contractor overloading problems, the second biggest cause of delinquencies, by the use of unrealistic PLTs in releasing procurement items and unrealistic delivery dates in solicitations.

[illegible] measuring the accuracy of delinquency calculations supported [illegible] that delivery effectiveness statistics were understated, perhaps as much as [illegible] percentage points. This was caused by erroneous delinquencies [illegible] recorded) and early deliveries (ontime shipments not [illegible]).

The study suggests that contractor-caused delinquencies could be reduced in several ways. The number of awards could be reduced to chronically delinquent and [illegible] contractors through the use of preaward surveys, the new F-12 Contractor [illegible] Report, and Contractor Performance History Committees. [illegible] could be [illegible] chronically delinquent suppliers.

[illegible]

Other significant production problems which impact heavily on personnel resources are SPN rejects (due to SAMMS-MOCAS incompatibilities), the number of expedite actions and status requests, sole source items, and the large volume of delinquencies which makes clearing up even trivial problems difficult.

Some of our major conclusions were that:

a. Even adjusted effectiveness rates need improvement; aging of delinquencies is an acute problem.

b. DLA is responsible for a significant number of overall delinquencies.

c. Both available tools for getting on-time delivery and personnel resources are not being optimally utilized.

A few of the more substantive recommendations include:

a. Elimination of SDDs in favor of a contractor's best realistic delivery date; more accurate methods of calculating PLTs.

b. Establish a new criteria for determining contractor responsibility.

c. Increase use of bilateral awards, terminations for default, and demands for consideration.

d. Discontinue routine F-18 mailings; instead work 90+ day and erroneous delinquencies.

e. Seek DCAS involvement in improving performance of the "100 Most Delinquent Contractors."

Source: Defense Supply Centers (DSCs)

1. TITLE: Backorder/Fill vs. SA Analysis

PERFORMING ORGANIZATION: Defense General Supply Center (DGSC)

DATE PUBLISHED: 13 August 1981

ABSTRACT: This study analyzes the correlation between stock availability and backorder lines on hand.

2. TITLE: Contractor Delivery Effectiveness at the Defense General Supply Center (DGSC)

PERFORMING ORGANIZATION: Defense General Supply Center (DGSC)

DATE PUBLISHED: 10 April 1981

ABSTRACT: This study was undertaken to further investigate the causes of continually poor contractor delivery effectiveness at DGSC. It is intended to supplement the DLA study entitled, "An Analysis of Contract Delinquencies," prepared by Mr. Philip S. Charon, in the DLA PDS, in November 1980. While the DLA study was composite of the four DLA hardware centers, this paper examines the specific problems applicable to DGSC.

A critical review and analysis of the DLA paper was conducted, along with interviews with key personnel in the Directorate of Contracting and Production (DC&P). Specifically, people from Support, Buying, and Production were interviewed

Based on the information obtained and review of past correspondence, the following conclusions were drawn:

a. The contractor delivery effectiveness problem, while not wholly under DCSC control, is, to a large degree, rectifiable.

b. Long range solutions to some of the major problems involved increased use of automation. In addition, more people were required. These two facts could not be mutually exclusive. That is, even with the addition of new automation, people are still required to operate the machinery.

c. Some regulatory changes are both desirable and in best interest of the government. These changes are important to being about significant lasting changes.

Some "easy" recommendations include the following:

a. Produce an automated listing of open contracts, sorted by contractor, to be mailed to contractors on a monthly basis.

b. Use RDDs judiciously. An RDD should only be used when it will be truly meaningful. RDDs should never be determined by the buyer, but instead should be generated by the end user or Supply Operations (e.g., the out-of-stock date on a routine buy). In all other cases, the contractor's best realistic delivery date should be used.

c. Make more extensive use of removal of fast pay privileges.

d. Increase defaults on bilateral contracts in a timely manner

A more complete summary of recommendations is included in part VIII.

[illegible] Backorder Seminar

PERFORMING ORGANIZATION: Defense Industrial Supply Center (DISC)

DATE PUBLISHED: August 1974

ABSTRACT: This briefing discussed the causes for DSC backorders.

[illegible] Material Obligations

[illegible] Defense Industrial Supply Center

[illegible] January 1981

ABSTRACT: This report examines the causes for DSC backorders

[illegible]

PERFORMING ORGANIZATION: Defense Electronics Supply Center (DESC)

DATE PUBLISHED: August 1981

ABSTRACT: This system is structured to identify the NSNs with the greatest number of potential backorder lines (PBL) so that action can be taken in sufficient time to preclude actual backorders from materializing on these items. Thus, the impact of each item on supply effectiveness can easily be assessed and the type/extent of corrective action determined and justified. System is now being tested.

6. TITLE: Backorder Study on NSNs in Top 100 Backorder Status

PERFORMING ORGANIZATION: Defense Electronics Supply Center (DESC)

DATE PUBLISHED: 2 Apr 1980

ABSTRACT: This study examines the types of items on backorder and cites the reasons the items are on backorder.

7. TITLE: Item Backorder Briefing at Commanders' Conference

PERFORMING ORGANIZATION: Defense Electronics Supply Center (DESC)

DATE PUBLISHED: April 1981

ABSTRACT: This briefing discussed causes for DESC's backorders.

8. TITLE: DESC-Wide Backorder Study Report

PERFORMING ORGANIZATION: Defense Electronics Supply Center (DESC)

DATE PUBLISHED: 31 July 1980

ABSTRACT: This study determined the causes for DESC's backorders.

9. TITLE: Procurement Cycle Period Study

PERFORMING ORGANIZATION: Defense Electronics Supply Center (DESC)

DATE PUBLISHED: Not Listed

ABSTRACT: This study develops economical procurement cycles for potential use in the DESC (SAMMS) requirements system.

10. TITLE: Determination of Optimum Alpha Factors

PERFORMING ORGANIZATION: Defense Construction Supply Center (DCSC)

DATE PUBLISHED: 11 June 1981

ABSTRACT: This study attempts to determine whether or not, for screening items, there is an optimum alpha factor that could be used either for individual NSNs or classes to most accurately forecast future demands.

Source: Miscellaneous Organizations and Components

1. TITLE: Procurement Workload vs. Workforce--A Growing Imbalance

PERFORMING ORGANIZATION: Logistics Management Institute (LMI)

DATE PUBLISHED: May 1981

ABSTRACT: This study analyzes changes in the size and complexity of DoD's procurement workload and workforce between 1975 and 1980. It identifies the factors which have made the procurement task more demanding and time-consuming: the growth in size of individual procurement actions, added legislative and administrative requirements, and changing economic conditions. It also identifies changes in size and skill level of the procurement workforce and summarizes reviews of conditions at 15 DoD procurement activities. The findings are that workload (measured by actions completed) increased significantly in both size and complexity. The workforce increased at a lesser rate than workload but not uniformly at each procurement activity. The workforce [illegible] procurement personnel was high [illegible] increased, while the average level of service decreased between 1975 and 1980. A significant number of [illegible] activities did not have enough [illegible] to process their workload. Despite positive actions (especially automation) to compensate for workload/workforce imbalances, there was an adverse effect on performance of the procurement function. The study recommends immediate action to increase the number of procurement personnel where needed, to keep better records of work in process, to increase automation; and to develop work measurement and manpower utilization and projection system.

2. TITLE: A Comparison of Two Different Measures of Effectiveness for Use in Optimization of Spares Support

PERFORMING ORGANIZATION: Defense Research Analysis Establishment

DATE PUBLISHED: July 1974

[illegible] one of the major factors in an equipment program is the cost of the support spares. The determination of how much to spend on spares depends [illegible] reliability predictions. It is well known that these predictions [illegible] are not correct when tested by experience. This diminishes the [illegible] in support plans and has led to skepticism about the value of reliability data. This question is exhaustively analyzed in this report using data for a major equipment. It is shown that for the majority of items in this case (more than 90 percent), it was possible by statistical techniques to have confidence in the support without an excessive economic penalty. A small number of outlying items can be identified for which no [illegible] can provide adequate support [illegible] special management techniques are recommended.

3. [illegible] Report Delivery in Department of Defense Production

[illegible]

[illegible] Naval Postgraduate School

[illegible] December 1980

ABSTRACT: Approximately one in four Department of Defense production contracts are being carried in a delinquent status. These late deliveries have a value of several billion dollars and 80 percent of the delinquent contracts are over 90 days late. The impact of these late deliveries effects many Military organizations in a variety of ways. The causes of delinquency stem from actions of the Government and the contractor. The Government attempts to use a number of incentives to motivate the contractor provide timely delivery of the required items. It also utilizes a variety of procedures in an attempt to control and reduce the number of delinquent contracts. Yet, a signficiant portion of the contracts are delinquent.

The objective of this research effort was to provide a survey study of the delinquency problem with a particular view of stimulating further in-depth research into its various aspects.

4. TITLE: A Note on the Calculation of Expected Time-Weighted Backorders Over a Fixed Interval

PERFORMING ORGANIZATION: Naval Research Logistics Quarterly

DATE Publication Made: December 1970

ABSTRACT: Two formulas are presented for calculating expected time-weighted backorders over a fixed time interval. One formula is a more precise form of a result found in the literature and is found using a direct intuitive approach. The second formula is derived using the steady-state distribution of inventory and is directly compatible with the use of steady-state (s, S) models.

The two formulas are compared and reconciled.

5. TITLE: A Model for Scheduling Physical Inventories

PERFORMING ORGANIZATION: USAF Inventory Research Office

DATE Publication Made: April 1970

ABSTRACT: Inventory models for many supply systems (e.g., that of the U.S. Air Force) must provide guidance as to when to reorder, dispose of [illegible] stock. Such decisions are based on recorded value of inventory levels which may be quite different from physical assets. If they are, incorrect or suboptimal decisions will be made.

Record errors are controlled by taking inventory. The problem investigated is to find cost effective policies for scheduling inventories which minimize the sum of the cost of taking inventories plus the costs incurred due to error accretion between inventories. A method is presented which quantifies these cost increases due to errors or "penalty costs" given an error growth process which depends on time between

6. TITLE: A Statistical Model for Aggregate Logistics Forecasting

PERFORMING ORGANIZATION: Operations Research Analysis Establishment

DATE Publication Made: [illegible]

ABSTRACT: The problem of procuring spare assemblies in support of new equipment has been studied for a considerable length of time and by many people. This paper describes an inventory model for procuring spare assemblies optimally and considers how the model is affected when different measures of effectiveness or utility functions are used. The inventory model is the METRIC model developed by the RAND Corporation now being used in the Canadian Armed Forces. The two measures studied are two fairly common measures; they are the backorder rate, which is the expected number of backorders at a random point in time, and the operational rate, which is the probability of no backorders at a random point in time. One would expect to arrive at different allocations of spares according to which measure is used for optimization. However, it is shown that the two optimizations differ only slightly in the realized availability of replacements.

7. TITLE: A Realistic Approach Modelling Stochastic Leadtime Distributions

PERFORMING ORGANIZATION: School of Business Administration
University of Missouri

DATE PUBLISHED: 2 May 1979

ABSTRACT: This paper presents some techniques for the realistic treatment of stochastic leadtime demands in inventory models. First, we suggest the use of the first four moments to describe the diversified distribution forms of the leadtimes and the daily demands; and formulas for deriving a leadtime demand's first four moments are presented. Next, we demonstrate the use of leadtime demand's first four moments in conjunction with the Johnson et. al.'s tables to obtain various probability estimates. Thirdly, we discuss the use of the versatile four parameter Schmeiser-Deutsch curves to fit a leadtime demand distribution. The computational advantages of using the fitted Schmeiser-Deutsch curves in solving inventory models are then illustrated.

8. TITLE: The Study of Production Leadtime Forecasting Models

PERFORMING ORGANIZATION: College of Business and Administration
Wright State University

DATE PUBLISHED: 1 October 1980

ABSTRACT: Production leadtime (PLT) has experienced great fluctuations over the last few years. This can have a great effect upon the inventory system of the Air Force. Presently, the Air Force uses a forecasting model which assumes that PLT in the next time period is equal to PLT in the last time period. In order to improve upon this method, this study investigated both the use of ARIMA and smoothing models for the prediction of PLT. The ARIMA model was chosen and used as the leadtime prediction model for PLT. It was found that a moderate number of data points was [illegible] for [illegible] models instead of the present Air Force model.

9. TITLE: Modelling of No Storage, Long Uncertain Leadtime Inventory Systems for Simulation

PERFORMING ORGANIZATION: School of Engineering
University of Missouri

DATE PUBLISHED: May 1980

ABSTRACT: The above topic was discussed at the 11th Annual Pittsburgh Conference on Modelling and Simulation.

10. TITLE: Materiels Management and the Bottom Line

PERFORMING ORGANIZATION: Journal of Systems Management

DATE PUBLISHED: April 1981

ABSTRACT: Materiels management means many things to different companies; but all agree that is is an organizational agreement concerned with the planning, scheduling, purchasing, and controlling of materiels for the organization. Purchasing of materiels includes the selection of acceptable suppliers and the timely delivery of materiels. Inventory control is a large part of the materiels management operation, including materiels cost control and cost reduction techniques. Top management will help achieve an efficient materiels management operation along with such management science techniques as value.

11. TITLE: Logisticians Need to Consider Operational Readiness in Setting Safety Level Stocks

PERFORMING ORGANIZATION: U.S. General Accounting Office (GAO)

DATE PUBLISHED: 10 August 1981

ABSTRACT: Maintaining a safety level of stock on hand is a form of insurance against unexpected demands or delays in delivery. However, the methods used for determining safety levels do not consider whether the items are essential to carry out a military mission.

Inventory management activities increase their effectiveness by ensuring that, within budgetary constraints, sufficient safety levels of low-cost, high-demand items are available to meet demands. However, these items are not necessarily those needed to maintain a high level of readiness.

The GAO believes that operational readiness should be the prime objective of logistics managers, as well as those responsible for maintaining a ready force, and makes a number of recommendations aimed at making this objective the guiding factor in the requirements determination process.

12. TITLE: Army Aviation Modification Problem

PERFORMING ORGANIZATION: U.S. Army Logistics Management Center

DATE PUBLISHED: March 1976

ABSTRACT: The backlog of unapplied modification work orders (MWOs) has reached unmanageable proportions under the present system of configuration management in the Army today. There are over half a million warehouses of MWOs unapplied to aircraft alone. Even though this backlog is half of what it was in 1973, unless changes are made in the methods of application and control of the existing modification program, this backlog can never be brought down to

an acceptable level. The Army must develop a program to reduce this backlog and prevent future backlogs from developing. The purpose of this paper is to: (1) identify the causes of the current MWO backlog; (2) examine the current programs designed to alleviate the backlog; and (3) analyze these programs.

13. TITLE: Audit of Stock Control Operations, U.S. Army Tank-Automotive Materiel Readiness Command, Warren, Michigan - Report of Audit

PERFORMING ORGANIZATION: U.S. Army Audit Agency

DATE PUBLISHED: December 1978

ABSTRACT: The U.S. Army Audit Agency made an audit of stock control operations at the U.S. Army Tank-Automotive Materiel Readiness Command (TARCOM) to determine whether selected supply actions were processed properly. The audit covered requisitions, materiel due in, backorders, and stock distribution. The audit was made during the period of April to November 1978.

14. TITLE: Aviation Supply Office (ASO), Philadelphia, Pennsylvania

PERFORMING ORGANIZATION: Naval Audit Service

DATE PUBLISHED: July 1977

ABSTRACT: This audit evaluated the accuracy of, and procedures relating to, data supplied in the ASO material due in/due out file. The review centered primarily on procurement and disposal information which comprised about 70 percent of the data recorded in the system.

15. TITLE: Aviation Supply Office (ASO), Philadelphia, Pennsylvania - Supply Management

PERFORMING ORGANIZATION: Naval Audit Service

DATE PUBLISHED: January 1979

ABSTRACT: The objective of this audit was to appraise the ASO implementation of the Cyclic Asset Reporting (CAR) program. The review evaluated [illegible] data and benefits attributed [illegible].

16. TITLE: Aviation Supply Office (ASO), Philadelphia, Pennsylvania - Supply Management

PERFORMING ORGANIZATION: Naval Audit Service

[illegible]

17. TITLE: [illegible] Support Center (ASSC), Philadelphia, Pennsylvania - Supply [illegible]

PERFORMING ORGANIZATION: Naval Audit Service

DATE PUBLISHED: May 1976

ABSTRACT: The objective of this audit was to appraise the ASO's performance in processing requisition follow-up and referral order bounce-back documents. Major emphasis was placed on reviewing and requisition processing procedures to determine if referral orders were processed within allowable time [illegible] and that bounce-back rates were reasonable.

[illegible] Deterministic, Two Echelon Inventory Model with an Arbitrary Number of Lower Echelon Activities

PERFORMING ORGANIZATION: Naval Postgraduate School

DATE PUBLISHED: March 1976

ABSTRACT: [illegible] economic order quantity (EOQ) model is extended to a deterministic, two echelon model with an arbitrary number of activities on the lower echelon. Two variations of the model are developed using minimization of the average cost as an objective. A no-stockouts-allowed case is examined and a method for finding the optimal solution is developed. A backorders allowed model is developed and partially solved here in general. A full solution is presented for a restricted range of lower echelon parameter values. Examples of the backorders allowed model are given and solved. The solution from this model are compared to those derived assuming the activities operate wholly independently. Significant potential reduction in variable time-average cost through the use of this model is demonstrated.

19. TITLE: Direct Support System (DSS), XVIII Airborne Corps and Fort Bragg, North Carolina

PERFORMING ORGANIZATION: U.S. Army Audit Agency

DATE PUBLISHED: February 1976

ABSTRACT: [illegible] was made to evaluate the effectiveness of the DSS at [illegible] to see if there were areas where management could improve its [illegible] operations. The audit was made as part of a multi-location audit [illegible] to be consolidated in a summary report to be issued later. The audit was made at the installation supply office, the 1st Corps Support Command, the [illegible] Materiel Management Center, and selected supply support activities. Specific areas of interest included [illegible] processing, [illegible] receiving, nonmoney reconciliations, stock control, 1st Corps [illegible] stock levels, and self service supply center operations.

[illegible] Characterization of Reparable Inventory Items from a Repair [illegible] Using Simple Forms of Consumption Process Models

[illegible] Naval Postgraduate School

[illegible] December 1976

ABSTRACT: [illegible] paper [illegible] real-time decision [illegible] stock [illegible] from which [illegible] a part of [illegible] The [illegible] of which [illegible] on the [illegible] the [illegible] to [illegible] a [illegible]

items coming out of repair. The main result shows that two published approaches, the transportation time look ahead policy and METRIC, are optimal when the number of users gets large. A useful by-product of the proof is a lower bound on the average backorder rate for a repair-inventory system of any size.

21. TITLE: Computation of Constrained Optimum Quantities and Reorder Points for Time-Weighted Backorder Penalties

PERFORMING ORGANIZATION: Naval Research Logistics Quarterly

DATE PUBLISHED: December 1977

ABSTRACT: The purpose of this paper and the accompanying tables is to facilitate the determination of constrained optimum order quantities and reorder points for an inventory control system where the criterion of optimality is the minimization of expected inventory holding, ordering, and time-weighted backorder costs. The tables provided in the paper allow the identification of the critical situations when order quantities and/or reorder points are restricted to subsets of values which do not include unconstrained optimal solution.

22. TITLE: Effects of Backorder Release Policies on Distribution Effectiveness and Customer Wait

PERFORMING ORGANIZATION: U.S. Army Logistics Management Center

DATE PUBLISHED: October 1978

ABSTRACT: This report determines when it is advantageous to hold stock and develops a simple method to determine how long to hold stock before releasing backorders to the customers of the out-of-stock depots.

23. TITLE: An Examination of the United States Air Force (O, R) Policies for Managing Depot Base Inventories

PERFORMING ORGANIZATION: Air Force Business Research Management Center

DATE PUBLISHED: August 1976

ABSTRACT: This report presents the results of a computer simulation experiment which compared the operating performance of the USAF current policy for managing depot base inventories of nonrepairable spares with the operating performance of two alternative policies; a system wide policy and allocation policy. The performance measures were: (1) average annual order plus [illegible] (2) [illegible] and (3) average [illegible] for the Oklahoma City Air Logistics Center.

24. TITLE: [illegible] for the Air Force Depot Base Inventories: A Pilot Study

PERFORMING ORGANIZATION: Air Force Business Research Management Center

DATE PUBLISHED: May 1977

ABSTRACT: The current United States Air Force (Q, R) policy for managing depot-base inventories for nonrepairable spares is examined and compared with three alternative policies via computer simulation. Two questions are examined. First, is it possible to formulate an alternative policy which has the same desirable properties of current Air Force policy (ease of computation and implementation) but which is somewhat closer to optimal from a cost and/or backorder performance standpoint? Second, is it possible to formulate an alternative policy which has most of the desirable properties of current policy, but which is substantially closer to optimal from a cost and/or backorder performance standpoint? Affirmative answers to both questions are suggested based on a very small number of items examined for approximately 1,200 item-years.

25. TITLE: Expected Number of Backorders with Control Levels

PERFORMING ORGANIZATION: Navy Fleet Material Support Office

DATE PUBLISHED: May 1974

ABSTRACT: This paper develops the equations for the expected number of backorders by issue priority group (IPG) in an inventory system with control levels and solves these equations in closed form for the geometric distribution. In the latter case, it further develops equations for control levels based upon relative importance of each IPG.

26. TITLE: An Experimental Examination on Nonstationary Behavior in Simulated Tests of Alternative Policies for Managing the USAF (Q, R) Depot-Base Inventories

PERFORMING ORGANIZATION: Purdue University

DATE PUBLISHED: December 1977

ABSTRACT: This report is the third and final in a series of studies by Dr. Leroy B. Schwarz concerning an investigation of USAF policies for managing depot-base inventories of nonrepairable spares. The first of the series, was a pilot study. The second study, LD 371823, used demand history for [illegible] that were currently stocked by two air logistics centers. It found that the two most promising alternative policies. System [illegible] This third report is an extension of the second one. It presents the results from a set of four experiments which were designed to investigate the feasibility of reducing or eliminating the nonstationarity of the test conducted in the second report.

27. TITLE: High Condition Rate of Air Defense Equipment and Excess Spare Parts at an Overseas Location Due TO Supply Support Deficiencies - Department of the Army

PERFORMING ORGANIZATION: U.S. General Accounting Office

DATE PUBLISHED: June 1974

ABSTRACT: [illegible] supply support for [illegible] Forces Europe at an overseas location disclosed that deficiencies in the supply management [illegible] their performance [illegible] to maintain [illegible] to prevent [illegible] to determine the amount [illegible] and the results [illegible]

stocks of repair parts for which there little or no demand. (This report is an unclassified summary of the SECRET report B-132990, April 30, 1964.)

28. TITLE: [illegible] Type Item Provisioning Guidelines

PERFORMING ORGANIZATION: Naval Research Logistics Quarterly

DATE PUBLISHED: June 1975

ABSTRACT: Policy decisions for insurance type items, where zero or one unit is maintained at the depot, are more difficult and more critical than decisions for common supply items. This report presents results of developing initial provisioning guidelines for insurance type items. The guidelines are based on examination of lifetime costs and benefits. Costs of stocking an item are compared with not stocking are developed through a sinking fund [illegible] present formulation. Benefits of stocking are developed as [illegible] reduction in time weighted backorders experienced. A resource allocation formulation provides an optimal policy for allocating a fixed [illegible] priorities for presented with requirements based on a sample of items. [illegible] of merit is computed for each item and if it is large, this item is [illegible] to be stocked. Empirical definitions for [illegible] of merit are given. Estimation techniques are discussed for deriving all of an item's parameters needed to compute its figure of merit. Bayes procedure is suggested based on family group experienced for replacement factors. This and other techniques are discussed.

29. TITLE: A Few Analysis of Lot-Size Model with Partial Backlogging

PERFORMING ORGANIZATION: Naval Research Logistics Quarterly

DATE PUBLISHED: June 1979

ABSTRACT: This article reformulates the cost equation for the lot-size model with partial backlogging. The formulation is in terms of [illegible] with a [illegible] [illegible] that simplifies the [illegible] The report [illegible] optimal solution is [illegible] [illegible] The [illegible] [illegible] [illegible] of the model. Some of these insights are [illegible]

[illegible]

PERFORMING ORGANIZATION: Naval Audit Service

[illegible]

31 TITLE: A Nonsteady-State Stochastic Representation of Supply System for [illegible]

PERFORMING ORGANIZATION: General Dynamic of Fort Worth

DATE PUBLISHED: December 1979

ABSTRACT: A probabilistic description of the supply system supporting a [illegible] a set of pre-combat nonsteady-state [illegible] rier an [illegible] and a general [illegible] is derived for the duration of a part [illegible] deployment. This expression is then [illegible] by which a parts inventory may be [illegible] stockage [illegible] downtime due to a lack of spare [illegible] deployment. In particular, an exact [illegible] of the selection of a spares kit which [illegible] a specified time period with only a limited local [illegible] backorder days of various supply [illegible] such as the log normal is compared

[illegible]: [illegible], Multi-Item, Multi-Facility, Finite [illegible], Production and Packaging Problem

PERFORMING ORGANIZATION: University of Florida

DATE PUBLISHED: June 1976

ABSTRACT: This note considers a multi-product, multi-item, multi-facility, scheduling problem over a finite planning horizon. Item demands are assumed to be known over each period which must be met without backordering. The problem objective is to minimize the sum of set-up and production costs for product classes, production cost for various items, and inventory carrying cost for the items. The problem is formulated as a 0-1 linear integer program which is [illegible] whose form is equivalent to the production [illegible] problem studied by Dorsey, et. al.

33 [illegible] for Recoverable Items

[illegible]: HQ Air Force Logistics Command (AFLC)

[illegible]: None

ABSTRACT: The AFLC recently implemented a procedure which utilizes [illegible] analysis to determine stockage levels for recoverable items. The [illegible] technique employed, the probability distributions used, and the necessary constraints are identified and discussed in this paper. These [illegible] variables, the turnaround time, base depot relationship, [illegible] as well as the quantity and condition of [illegible] are used to derive the final stockage levels. The results of [illegible] technique are also displayed and discussed.

34 TITLE: [illegible] for Developing Pipeline Factors

PERFORMING ORGANIZATION: [illegible] Research Corporation

DATE PUBLISHED: [illegible]

ABSTRACT: This report proposes a computerized methodology to provide Army supply distribution systems managers with dollar weighted order ship time and dollar value of a pipeline day planning factors using data resident in the logistics intelligence file and catalog data from the Army Master Data File.

35. TITLE: Procurement Leadtime, USAECOM Stock Fund Materiel

PERFORMING ORGANIZATION: U.S. Army Electronics Command (USAECOM)

DATE PUBLISHED: January 1965

ABSTRACT: This study determined whether or not with USAECOM excess, procurement leadtime for stock fund items contributed to backorders or degraded supply effectiveness and if operational improvements could be effected in [illegible]

36. [illegible] Report on the Review of Selected Areas of Customer Support, [illegible] Industrial Supply Center (DISC), Philadelphia.

[illegible]

[illegible]: Defense Audit Service

DATE PUBLISHED: February 1980

ABSTRACT: This is the report of a review of selected customer support [illegible] The objective of the review was to evaluate the effectiveness of the Center's procedures and controls for processing customers' requisitions for materiel. Over 5.5 million requisitions are processed annually by DISC. DISC's materiel availability rate for stocked items as of [illegible] percent.

37. TITLE: Review of the Validity of, and Controls Over, the Large Volume of Unfilled Orders for Air Force Materiel - Department of the Air [illegible]

[illegible]: U.S. General Accounting Office (GAO)

[illegible]: June 1967

[illegible] made of the validity of, and controls over, the large volume of unfilled orders for spare parts and equipment that were placed in backorder status. The report concluded that supply effectiveness in the Air Force could be improved and the volume of assets on backorder significantly reduced. Procedures could be established at the base level [illegible] reconciliation of backorders not supported by valid [illegible] Actions being taken [illegible] progress to [illegible]

[illegible], Philadelphia, [illegible]

[illegible]: Defense Audit Service

[illegible]

ABSTRACT: This review of backorder requisitions was part of the FY 76 continuous audit plan for the SPCC. Special emphasis was placed on the backorder validation process. The audit included a review of both internal and external aspects of backordered requisitions and also a review of backorder procedures and reports; the backorder release program and the materiel obligation validation program. A sampling of foreign military sales requisitions was included

[illegible]. TITLE: [illegible] Safety Level (VSL) Improvement Project

PERFORMING ORGANIZATION: HQ Air Force Logistics Command (AFLC)

DATE PUBLISHED: None

ABSTRACT: [illegible] currently bases its procurement of [illegible] stocks for [illegible] items on a VSL requirements process. The object of [illegible] the VSL computation by evaluating [illegible] several imposed management "floor and ceiling" [illegible]

[illegible]. TITLE: [illegible] of Parts and Materiel

PERFORMING ORGANIZATION: Analytic Science Corporation

DATE PUBLISHED: December 1980

ABSTRACT: This study analyzes data on selected Air Force systems, sub-systems, and components with regard to lead time. The first phase of the study resulted in a preliminary analysis of the data and highlighted areas for more detailed analysis. This report focuses accordingly on five components: bearings, castings, connectors, forgings, and integrated circuits which have long leads related to sub-system and system delivery times. Reasons for increased lead time frames are provided and recommendations made for actions which would lead to decreased leadtimes in the future. A definition of a model for [illegible] of critical parts and materiels is contained in the final [illegible]

[illegible]. TITLE: [illegible] of Production Leadtime (PLT) for Missile Repair Parts [illegible] Devices with Cable Assemblies and Wiring Harnesses

PERFORMING ORGANIZATION: DARCOM Intern Training Program

DATE PUBLISHED: April 1975

ABSTRACT: The inability to accurately predict PLT for items being produced or procured is one of the major problems faced today by customers and producers. This problem plagues private industry and the various government agencies responsible for providing equipment for the [illegible]. Management personnel of the Army Missile Command are currently concerned with the late delivery of repair parts for their missile systems. This investigation was undertaken to help in the development of a methodology for predicting PLT for missile repair parts containing [illegible] cable assemblies and wiring harnesses. Techniques of [illegible] and analysis [illegible] based on the data obtained were used to [illegible] cable assemblies and wiring harness contracts.

42. TITLE: Audit of Procurement-Related Functions, Defense Industrial Supply Center (DISC), Philadelphia, Pennsylvania

PERFORMING ORGANIZATION: Defense Audit Service

DATE PUBLISHED: October 1980

ABSTRACT: This report presents the results of an audit of selected procurement-related functions at DISC. The objectives of this audit were to: (1) determine the causes for the high volume of small purchase awards processed manually; (2) evaluate Center controls over receipt data for fast payment awards; and (3) analyze the procedures used to adjust procurement leadtimes in the supply records.

43. TITLE: Economic Order Quantities (EOQs) In Cases of Price Breaks, Order Cost Breaks, or Leadtime Breaks

PERFORMING ORGANIZATION: ORI International

DATE PUBLISHED: March 1981

ABSTRACT: This memorandum describes practical, iterative procedures for determining EOQs when price, order costs, or leadtime breaks exist. The first section discusses the price break problem, describes the recommended computing procedure, and illustrates the use of the procedure by means of practical examples. The second section describes a procedure for handling breaks in order cost, and leadtimes together with examples of the computations.

44. TITLE: Forecasting Administrative and Production Leadtime (ALT/PLT) for Secondary Items

PERFORMING ORGANIZATION: U.S. Army Armament Materiel Readiness Command

DATE PUBLISHED: September 1979

ABSTRACT: The purpose of this study was to provide improved forecasts of ALT/PLT of secondary items for use by IMs; to obtain data from Commodity Command [illegible] for secondary items issued by [illegible] and to develop [illegible] to support corrections at desired level of [illegible] of [illegible] sector data and compare with DSS data. The resulting methods will be used by IMs as a means of improving ALT/PLT estimates pertaining to the evaluation of safety stock levels and order points.

45. TITLE: Computer Program for Long Procurement Leadtime Material

[illegible]

[illegible]

ABSTRACT: The purpose of this study is to provide a method [illegible] Material or Manufacturing Process.

46. TITLE: [illegible] Procurement and Contracting Methods

[illegible] Materiel Development & Readiness Command

DATE PUBLISHED: May 1973

ABSTRACT: This report provides the progress made by Army Materiel Command elements during the 3rd quarter of FY 73 on the impact program. Specific tasks included in the report are: accelerated development of reliability, analysis of cost growth, Army contractor cost and schedule performance measurement, [illegible] for Outstanding Achievement in Materiel Acquisition, [illegible], enhancement of logistics careers for military officers, [illegible], improvement in technical data, [illegible], reduction of data required [illegible], and for evaluating offerors in future project managers, [illegible] and reporting the quality of AMC civilian procurement [illegible].

[illegible]

[illegible] Armed Forces Staff College

[illegible] May 1973

[illegible] paper examines the feasibility of reducing criteria or [illegible] to organize the present system for developing new qualitative [illegible].

[illegible] Development of Guided Missiles

[illegible] International

[illegible] October 1970

[illegible] method for analysis and evaluation of weapons [illegible] developed by the contractor to give better information to [illegible] concerned with allocating national resources among [illegible]. The method for analysis and evaluation can be summarized as [illegible] and is specifically concerned with leadtime.

[illegible] Variability in Inventory Requirement Projections

[illegible] Jack C. Hayya Associates

[illegible] June 1980

[illegible] The Air Force has experienced inventory support problems [illegible] variability. This study was to find out what [illegible] significant influence on safety stocks. [illegible] distributions to leadtime [illegible] the Laplace distribution [illegible] 90% service optimization model for the distribution.

[illegible]

[illegible]

DATE PUBLISHED: Setember 1979

ABSTRACT: This is the final report for the U.S. Army Inventory Research Office study, "Measurement and Implications of PLT Variability," (Project 229). It describes impirical work on methods ot forecasting PLTs for secondary items. The forecast and measure of its variability are to be used in the [illegible] module of the CCSS. A 6-year data base of the procurement history for aviation components was compiled and utilized in simulations of the candidate forecast methods. A method was selected on the basis of smallest aggregate forecast error. A test of this method suggests a significant improvement over the presently used forecast method.

51. TITLE: Methods of Analysis and Working Hypotheses for Reducing Leadtimes in Materiel Development

PERFORMING ORGANIZATION: The John Hopkins University

DATE PUBLISHED: December 1958

ABSTRACT: [illegible] three methods of analysis for studying leadtime [illegible] statistical approach, case history approach, and use of the [illegible] and proposal of hypotheses that show promise for significant reduction in leadtime.

52. TITLE: Negotiated Procurement Leadtime

PERFORMING ORGANIZATION: SRI International

DATE PUBLISHED: March 1961

ABSTRACT: This memorandum describes general procedures for determining optimal leadtime and certain formulas relative to this problem are derived for the case of Poisson demand and fixed leadtimes. A particular example is given to illustrate a technique for solving a practical problem. The results of this [illegible] suggest that, unless the unit price increases very slowly as the [illegible] is decreased, a point is quickly reached where it does not pay to reduce the leadtime further.

53. [illegible] Uncertainty and Joint Costs, Part II

PERFORMING ORGANIZATION: Carnegie-Mellon University

DATE PUBLISHED: [illegible]

ABSTRACT: [illegible] with the problem of order size in [illegible] procurement [illegible] much to [illegible] should be given.

54. [illegible]

[illegible] Management [illegible]

[illegible]

In recent times procurement managers have complained to [illegible] much management prerogative out of the[ir] [illegible] management practices must be re-evaluated in terms of [the] [illegible] Procurement managers need a more appropriate [set] [illegible] against which to measure the effectiveness of [the] [illegible] are responsible. Thus, by measuring the accomplishment [of] [illegible] criteria procurement managers will be better a[ble] [illegible] [the] procurement cycle. This [illegible] develop more [illegible] [illegible] reflect a The objectives of this proje[ct] [illegible] Major Subordinate Commands currently [illegible] evaluate compliance with PAIT objectives as a means [of] [illegible] management and performance criteria

[illegible]

[illegible]

[illegible]

[illegible] Procurement and Production Directorate [illegible] [illegible] to improve the organizational [illegible] [illegible] to operational problems in processing [illegible] [illegible] Request Order Numbers (RON's) [illegible] [illegible] force had been [illegible] [illegible] solutions to PAIT [illegible] [illegible] assist the P&P task force [illegible] [illegible] are expanded by a general review of the PWD/[illegible] [illegible] ized report, prepared by the P&P task force [illegible] [illegible] Procurement and Production [illegible] [illegible] study team was requested to make a detailed [illegible] [illegible] if this VA [illegible] RON's could be reduced. [illegible] [illegible] [illegible] reduce [illegible] [illegible] [illegible] RON's [illegible] [illegible] and buying organizational elements.

[illegible] Purchases

[illegible] U.S. Army Logistics Management [illegible]

[illegible] (June 197[illegible]

[illegible] of this study is to determine if [illegible] [illegible] different among the [illegible] [illegible] procurement procedures are in use and what [illegible] [illegible] reduce costs of [illegible] [illegible] final approval.

[illegible] of the [illegible] analysis

[illegible] [illegible] and Methodology

[illegible]

ABSTRACT: The purpose of this study was to investigate the current method of leadtime forecasting and to recommend improvements to the requirements determination process.

58. TITLE: Procurement Leadtime, USAECOM Stock Fund Materiel

PERFORMING ORGANIZATION: U.S. Army Electronics Command (USAECOM)

DATE PUBLISHED: January 1965

ABSTRACT: This study determined whether or not with USAECOM excess... procurement leadtime for stock fund items contributed to backorders or degrad... supply effectiveness and if operational improvements could be effected in t... area.

59. TITLE: Procurement Leadtime, Navy Complex Items

PERFORMING ORGANIZATION: Logistics Management Institute (LMI)

DATE PUBLISHED: December 1966

ABSTRACT: This task was to conduct a time-oriented procedures analysis of each step in the procurement process associated with complex items in the Bureau of Ships and the Bureau of Naval Weapons. The total span of activities embraced in this study ranges from the first efforts to draft a procurement request until a definitive contract has been signed by the Government. Conclusions and recommendations that effect a predictable reduction in procurement leadtime are reported. Also, other recommendations are made that have an impact on procurement leadtime but cannot be readily measured.

60. TITLE: Reducing Leadtime Through Improved Technological Forecasting: Some Specific Suggestions for More Usefully Formulated Projections of Technological Availability, by David Novick and Frederick S. Pardee

PERFORMING ORGANIZATION: The Rand Corporation

DATE PUBLISHED: June 1959

ABSTRACT: The purpose of this paper is to suggest a series of refinements in the methodology of technological forecasting. These suggestions are designed to increase the utility of information generated in such forecasts by communicating more fully both the major underlying assumptions and the specifics of the resulting projections. It is important to point out that the primary [illegible] of technological forecasting is [illegible] for planning and decision making in research and development programs.

61. TITLE: [illegible]

PERFORMING ORGANIZATION: U.S. Army Electronics Command (USAECOM)

DATE PUBLISHED: July 1972

The objective of this study was to identify means of improving the [illegible] of automatic items. Specifically, the "fill rate", termed the stock availability, was to be investigated for improvement.

APPENDIX H
Study Plan

Seasonal Forecasting

I. PURPOSE: Develop an up-to-date seasonal forecasting technique for DLA's subsistence items that can be extended for all SAMMS secondary items.

II. BACKGROUND:

A. Forecasting for inventory decisions in DoD operates under DoDI 4140.39, "Procurement Cycles and Safety Levels of Supply for Secondary Items," (Enclosure 2) VI: "In order to develop levels and economic order quantities, it will be necessary to determine expected requisition size and to estimate the mean leadtime demand and the variance of leadtime demand."

B. DLA LF has been charged with developing an automated system for managing the subsistence commodity, to include provisions for handling the three subcommodities, perishables, nonperishables, and commissary items. DLA LF feels that the forecasting technique used in SAMMS (double exponential smoothing) is not state of the art and may not handle seasonal items adequately. Therefore, they requested DLA-LO to discover what forecasting technique should be used for subsistence seasonal items.

III. SCOPE: This study will give recognition to the central role of exploratory data analysis, including the newer computerized techniques from discriminant analysis, in order to achieve greater precision. All perspectives of demand forecasting will be examined: the entire past history of the series; the influence of new data; and the effect of exogenous variables. No restriction will be made on nonlinear models, adaptive or multi-variate methods, or the exercise of judgemental factors.

IV. APPROACH: Desirable characteristics include: generality (number of [illegible] type of time series that can be handled); optimality (full use of [illegible] is available); simplicity (ease of use by nonexperts); flexibility (adaptation to changes in system); reliability (robustness and correct [illegible] limits); verifiability (self-verification and control); interpretability (communication of results), objectivity (correspondence of criteria to objectives of forecasting); sequentiality (proper stages for each [illegible] to exist); and parsimony (few parameters to calculate). The stages will analyze decision making system; develop conceptual model describing mechanism influencing forecasts; define data available and not available; develop method for generating forecasts; conduct experiments to assess accuracy of [illegible] how judgements are to be incorporated into forecasts; [illegible] and [illegible] expertise, retrospectively its effectiveness.

[illegible] will be selected from the [illegible] will be determined by cluster analysis. Optimum criteria will be determined by [illegible] theory, [illegible] and forecasting statistics. [illegible] will be extended by adaptations of exponential smoothing, include [illegible] forecasting. As time permits, concomitant attention will be given to

[illegible] utility (e.g., intervention analysis and [illegible] ages will be purchased outright or obtained from [illegible]. These methodologies require the combination of [illegible] with in-house investigations; this is necessary be[illegible] quantity types suggests a multi-directional effort [illegible] existing techniques requires specialized expertise.

[illegible] Phase	[illegible] Effort
[illegible] Data Process	Six (6) months
[illegible] Evaluation	Minimal

	Estimated Completion
[illegible]	[illegible] Dec 82
[illegible]	[illegible] Nov 82
[illegible] programs	[illegible] Dec 82
[illegible] commodity	[illegible] Feb [illegible]
[illegible] proposal	[illegible] Apr [illegible]
[illegible] demand	[illegible] Jan 83
[illegible] systems	[illegible] Oct 82
[illegible]	[illegible]
[illegible]	[illegible] Sep [illegible]
[illegible]	[illegible] Dec 82
[illegible] tapes	[illegible] Nov 82
[illegible] smoothing	[illegible] Nov 82
[illegible] and filtering	[illegible] Dec 82
[illegible]	[illegible]
[illegible] techniques	[illegible]
[illegible]	[illegible]


FILM